





NEW ELEMENTS  
OF  
OPERATIVE SURGERY:

BY

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CAREFULLY REVISED, ENTIRELY REMODELLED, AND AUGMENTED WITH

A TREATISE ON MINOR SURGERY.

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OVER 200 ENGRAVINGS, INCORPORATED WITH THE TEXT:

ACCOMPANIED WITH

AN ATLAS IN QUARTO OF TWENTY-TWO PLATES,

REPRESENTING THE PRINCIPAL OPERATIVE PROCESSES, SURGICAL INSTRUMENTS, ETC.

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# NEW ELEMENTS

OF

## OPERATIVE SURGERY.

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### SECTION SIXTH.

#### VENOUS SYSTEM.

THE same operations are practised upon the veins as upon the arteries; this class of vessels in fact, like the arterial system, is liable to wounds, fungous degenerations, and hypertrophy.

*Wounds.*—The wounds of the venous system, however, unless they should be situated upon trunks of the first order, the vena cava, internal jugular veins, subclavians, axillaries, iliacs, femorals, or popliteals, rarely give rise to dangerous hemorrhages, and if they are formidable they are rendered much more so by the inflammation they cause, than by the loss of blood that proceeds from them.

[A blow on the jugular vein has in several instances been the cause of almost immediate death. Two instances of the kind have lately come to our knowledge, and in the *Lond. Lancet*, Jan. 1845, two other cases are reported, in one of which, a blow on the side of the neck caused death in 24 hours; in the other, the person struck fell dead instantly. In the last case, a large quantity of effused blood was found in the lateral ventricles, and in the fourth ventricle. Effusion was likewise found on the surface of the brain, in the instance where the patient survived for a day. *Vid. Amer. Journ. Med. Sciences*, Oct. 1845. G. C. B.]

Wounds of veins differ also essentially from wounds of arteries in cicatrizing with facility, without necessarily involving the obliteration of the wounded vessel. It results from this, that if a large vein is divided upon its side, and that compression is not sufficient to put an end to the hemorrhage, the ligature will not have to embrace its entire calibre. The most convenient and secure process in such cases, consists in seizing the two lips of the opening with the tenaculum, and in then passing a thread around the wound on the side of the vein, which thus cicatrizes without difficulty and without interposing any obstacle to the circulation.

[Mr. Guthrie treated a case of wound of the internal jugular vein in this manner. The thread was passed around the opening so as not to obliterate the trunk of the vessel. G. C. B.]

When a vein is divided transversely, whether we compress it or apply a ligature to it, it rarely happens that it becomes necessary to act upon any other portion of it than the inferior extremity. However, it might be necessary to obliterate the other end also, if the wound was situated in the neck, in the upper part of the arm, or even in the fold of the groin. I have often seen the popliteal vein pour out blood copiously by an actual reflux movement.

When veins are found in the wounds of an amputation, it is generally useless to apply a ligature to them. Nevertheless, if they keep up a hemorrhage, I think we should do wrong not to tie them. The dangers of this ligature, upon which so many surgeons have insisted for half a century, are shown to be farthest from the truth, (*vid. Process for tying the Carotid,*) and I should not be surprised to find that it would prove more advantageous to surround them immediately with a ligature, than to leave them free at the bottom of the wound.

As for the rest, almost all the operations that have been practised on veins, seem to have been devised for cases of varices. This article, therefore, will be devoted to the treatment of these affections.

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## CHAPTER I.

### OPERATIONS REQUIRED FOR VARICES.

Though varices do not constitute a disease essentially dangerous, they may often so far incommode those who are affected by them, as to make it proper that surgical aid should be had recourse to for their treatment. The trouble, deformity, and ulcers that they cause or keep up, and the hemorrhages which sometimes take place from them, sufficiently explain the solicitude which they have occasioned at every epoch of the science.

#### ARTICLE I.—VARICES IN GENERAL.

The ancients, who employed topical applications, astringents, desiccatives, and resolvents for varices, used, also the compressing bandage, applied to the whole extent of the limb, and professed to aid their action by means of internal remedies. Then, as at the present day, those different modes of treatment were nothing more than simple palliatives. To obtain a radical cure, they had recourse to operations properly so called.

## § I.—Ancient Methods.

A. *Acupuncture*.—Sometimes it was thought sufficient, in conformity with the recommendations of Hippocrates, and as was also advised by Paré and Dionis, to puncture the varices, (Hipp. *Traité des Ulcères*, à la fin,) and incise them lengthwise, but *more freely than in phlébotomy*, in order to empty them of their blood and clots. "Practitioners of the present day," says De Gouey, (*La Véritable Chirurgie*, p. 236,) make use of a needle of gold or silver, with which they puncture these tumors to empty them of their blood; but this operation is but a feeble resource."

[In *Ranking's Abstract &c.* p. 110. Nov. 1847. is the report of a very remarkable case of varices in the lower extremity cured by means of the Electro-Puncture. G. C. B.]

B. *Cauterization*.—According to Avicenna, the vein should be seized with hooks at two points, distant three fingers' width apart, then tied with a good silk thread, and divided transversely upon the space between the ligatures; after which, the ligature upon the lower end is to be removed, in order to bring the blood from below upwards, and to force out as much of it as is possible with the hand; then to cauterize the upper end of the vessel, and even the whole extent of the wound, with a hot iron or arsenic. Avicenna appears to have been the first, in the treatment of varices, who actually applied methodical compression from the foot to the knee.

Others tore out the varices, after having cut into them; this, at least, is what Ali-Abbas appears to recommend. Celsus (*De Re Med.*, lib. 7, cap. 31, Ou Ninnin, t. II., p. 371) speaks of cauterization and extirpation, and all the world know from Plutarch, (*Hommes Illust.*, t. IV., p. 380, Trad. de Dacier,) that the stoic Marius—who, remarking that the remedy was worse than the disease, declined presenting his other leg covered with varices, to the surgeon, who had removed them from the first—had undergone this last named operation. Dionis (*Operat.*, p. 766, 9e Demonstr.) is astonished that the ancients did not advise the hot iron to traverse (*barrer*) the varicose veins, as is done with horses, and that they should have been satisfied with the potential cautery. An enormous varix was cauterized and cured by Bidloo,) Coll. de Villars, *Cours de Chirurgie*, t. I., p. 434—439.) Bayrns (Louis, *Dict. de Chirur.*, t. I., p. 561) speaks of a varix that resembled gutta rosa, and which he cured by *cauterization of the frontal vein*. We are not surprised to see M. A. Severin (*Med. eff.*, p. 368, ch. 98, Exopirie) cauterize with the red-hot iron. Dionis admitted, however, that the roller bandage, in form of a buskin, (*bottine*,) was preferable to all other means. This was also the recommendation of the greater number of the surgeons of our epoch, when an attempt was made, some years since, to simplify the operations of the Greeks and Arabs.

[The application of caustics has been highly lauded by M. Bonnet of Lyons. Mr. Skey, of St. Bartholomew's Hospital, London,



has employed this method of treatment in an immense number of cases, and he claims for it, that it is effectual and unattended with danger. He employs a paste, composed of three parts of lime and two of potass, and prepared with spirits of wine, at the time of its application. The eschars must not be larger than a pea, and their number should be in proportion to the extent of the disease. A paste of the chloride of zinc is used by others for the same purpose. G. C. B.]

C. *Excision*, either simple, or as Celeus describes it, or as it must have been performed upon the leg of Marius, or combined with the ligature as in the process of Galen, or that preferred by Paul of Egina, (Vid. Vidius, *Comment sur Gal.*, lib. 6, cap. 83,) is but rarely necessary, and cannot be required, as Boyer remarks, but for those large tumors or varicose bunches which are sometimes met with in the legs; it is also uncertain if it might not even then be superseded with advantage by processes more simple. We may learn; from J. L. Petit, (*Œuvr. Chir.*, p. 266, 267, 279, 280,) the kind of hemorrhage to which patients may be exposed from the incomplete extirpation of varicose veins.

D. *The Ligature*, which was distinctly recommended by the ancients after excision, and which Dionis describes with much minuteness, (*Oper. Cit.*, p. 765,) was frequently employed by Ev. Home, in England, and by Bécларd in France. We take up, says M. Briquet, (*Thèse No. 193*, Paris, 1824,) who relates the results obtained by Bécларd, a longitudinal fold of the skin on the point where the vein is alone and most superficial, and divide the fold down to its base; we then pass under the vein an eyed probe furnished with a ligature, and after having tied the same, divide the vessel immediately above it. We may also cut the skin and the vein at a single stroke, and then tie the lower end of the venous canal by seizing it with the forceps. Strips of adhesive plaster serve to hold together the lips of this little wound, and the patient is to be kept at rest.

MM. Smith, Travers, and Oulknow, have followed the method of Home; but not with as constant success. Physic, however, says, he has great reason to be satisfied with it, and M. Dorsey, (*Elements of Surgery*, Vol. II., p. 404,) who frequently made trial of it, affirms it, that it was never, in his practice, attended with any serious accidents. According to Briquet, at no time during the service of Bécларd at La Pitié, did this method ever produce an unpleasant symptom, except in two cases, out of an aggregate of sixty persons operated upon. It is difficult, in fact, to understand how this ligature, if properly applied, could be attended with much pain, or be followed by tetanus, as has been pretended, or why inflammation of the vein, on the eardial side of the disease, should be more frequently caused by this than by any operative process, which causes the obliteration of the vessel.

The process of M. Gagnères, referred to by Maréchal, (*Thèse de Concours*), and which consists in passing a ligature around the vein through a simple puncture in the skin, would have no other effect than to render the operation more difficult without diminish-

ing its inconveniences. "Nevertheless," says Chumette, (*Enchiridion de Chirurg.*, liv. 1, cap. 58, p. 278,) "I am in the habit of introducing with less trouble and pain, and by means of a sharp, curved needle, a ligature under the vein, then tying it and leaving the thread there until it comes away of itself." Does Lombard, (*Clinique des Plaies Recentes*, an VIII., p. 248,) where he relates that some recommended incising to the right and the left upon the side of the vein to avoid the inflammation which must ensue from puncture with the needle and insertion of the ligature; and that others call this inflammation in question, wish us to infer that they knotted the ligature upon the skin? De Gouey, (*Op. Cit.*, p. 237,) who tied the vein below the varix, and then divided it above, followed this practice with much success. Lombard, (*Op. Cit.*, p. 248,) who had recourse but once to the ligature, applied it at 6 or 7 millimeters below the tumor, inserting under the vein a needle of the shortest possible curvature, and laying a small compress of four double along the course of the vessel, in order to support the knot of the ligature, and render the whole secure. Afterwards opening the tumor, he dressed with a pledget of lint dipped in alcohol. M. Cantoni, (*Observation des Sc. Méd. de Marseille*, Juillet, 1825, trad. par Gérard,) who relates twenty cases, four of which are taken from his own practice, and others from that of Vacca, Mori, and Orlandi, says, that after having made trial of the ligature, recision and excision, this last offers the most favorable prospect of success: but Vaca Berlinghieri, (Valentin, *Voyage en Italie*, 1re edit., 1825, p. 94, et trad. par Gérard, 2e edit., 1826,) who, in 1820, had already in six cases effected the cure of varices by the ligature according to the method of Home, *has seen the disease reproduced*, and some time after, having seen a man upon whom a surgeon had performed incision of the vein above the knee with success, he wrote to Valentin, *that seeing that the dangers surpassed the advantages that had been hoped for by different processes, he had abandoned all of them, and no longer practised the operation for varices.*

E. *Incision.* Not wishing to confine himself to the simple ligature, M. Richerand supposed that by incising in a direction paralalled to the limb, and to a great extent the tortuous bunches or varicose pelotons, he would be more sure to succeed. I have many times seen him at the hospital of San Louis employ this practice with entire success, and I have myself used it with advantage upon a number of patients; but the only one upon whom I performed it at the hospital of La Pitié died on the ninth day. We select the part on the limb where there are the greatest number of varices collected together, then with a convex and very sharp bistoury, we cut deeply and to the extent of four, five, six, and even eight inches. After having emptied the veins of the clots by pressure, the wound is filled with lint covered with cerate, and applied either directly or upon a piece of fine perforated linen; the first dressing after this is not made until at the end of three or four days. Then the venous orifices are found closed, and the wound may be dressed flat like any other simple solution of continuity. Bécларd proceeded in the same manner in several cases, and was not less fortunate than M.

Richerand. Those long gashes, however, have something frightful in them to the patient, and reflecting seriously upon them, we cannot see what great utility they can have. In conclusion, we must not confound this method with the simple long incision recommended by Avicenna, (Huguier, *Thèse de Concours*, 1825, p. 12.)

F. The *section*, upon a single point selected, or on different branches when we do not wish to act upon the principal trunk of the vein, would be evidently preferable to the preceding operation. I have performed it fifty-two times at the Hospital of San Antoine and at La Pitié, in the space of six years. One of the patients, it is true, died on the twelfth day, but with ataxic symptoms of a very unusual character, which could only be accounted for from the state of fear or unaccountable morbid apprehension under which he labored before the operation. We met with no traces of phlebitis above the wound, and that which existed below it was found to be wholly disproportionate to the severity of the symptoms. Another died from the effects of a true phlebitis. In three other cases, the phlebitis, after having given occasion to unpleasant symptoms, terminated in abscesses about the wounded vein. The cure was afterwards accomplished without difficulty. M. Warren, who has frequently practised this method, told me that he had always found it to answer well. Nothing is more simple than an operation of this kind; the vein is first raised up in a fold of the skin; a narrow and keen-edged bistoury then passed through the base of this fold, effects the division of it with a single stroke; we thus successively practise the incision upon all the veins that are somewhat considerable in size, and that appear to come from the varicose bunches. The blood immediately escapes in large quantity; and we allow it to flow for a greater or less length of time according to the strength of the patient, after which the wound is filled with small balls of lint, before covering it with a plumasseau of the same material spread with cerate, and then with soft compresses; the whole should afterwards be supported with a roller bandage moderately tightened; if we attempted primitive coaptation, the continuity of the vein might be re-established, and thus defeat the object of the operation.

G. M. Brodie, with the view more effectually to guard against phlebitis, (S. Cooper, *Surgical Dictionary*, t. II, p. 594,) confines himself to dividing the veins transversely by making only a simple puncture in the skin. For that purpose he makes use of a bistoury with a narrow blade and a little concave upon its cutting edge. The point of the instrument is first passed through the integuments upon one of the sides of the vessel; it is then made to glide flatwise between the vein and the dermis; when it has reached the opposite side, its cutting edge is turned backwards, and the wrist at the same time raised in such manner as to divide the venous cord perfectly while withdrawing the bistoury. M. Carmichael and other practitioners have greatly extolled this process; a patient upon whom M. Bougon performed it in my presence, also did remarkably well under it; but Béclard, who made trial of it at La Pitié, affirms that it gives us no better security against phlebitis and phlegmo-



nous erysipelas than the ordinary incision, and moreover, that it sometimes fails in producing the obliteration of the vein. I agree entirely in opinion with Bécларd, and can add, that without securing us against any danger, this process is the most difficult and the least certain of all.

H. *Exsection* which had already been practised from the time of Celus, Paul of Egina, Avicenna and Albucasis, has found some partisans among surgeons of the present day. The two ends of the vein, by retracting under the lips of the wound, cease to be exposed to the influence of the external air, an action which, according to M. Brodie, is a powerful cause of phlebitis. This last argument is entirely hypothetical, and not deserving of the importance that a surgeon of Paris (*Rév. Méd.*, 1836, t. I., p. 29,) has given to it while claiming it as his own property. To say that if an inch of each end of the vein under the skin is not removed, the air may bring on a phlebitis capable of causing death in *twenty-four hours*, is an absurdity which I have no need of making any remark upon.

[About twelve years since, a number of cases of varicose veins in the lower extremity, were treated in this city by exsection, and the application of the starched bandage. At length fatal cases occurred, and this method was abandoned. . G. C. B.]

1. *Appreciation*.—In conclusion, the avowed and unquestionable purpose of the operator is to obliterate the veins that have become varicose ; but it cannot be denied that the ligature, without or with the section, or whether that section be transverse or longitudinal, open or under the skin, and that extirpation itself as well as cauterization with potash or the red-hot iron, may all bring about this result, and that this constitutes the whole amount of relief they are capable of affording to the patient. It is desirable, therefore, to know which of all these means is that which produces the least pain, may be performed with the most ease, and exposes to the least danger. The transverse section of the vein, including the skin with it, possesses the different advantages of the other methods, combined with all the simplicity that could be desired.

[Whoever may be the author of the germ of the idea, it is one that undoubtedly belongs to *sub-cutaneous* surgery, though this is obviously one of those cases where the principle or leading feature of this method seems not only not applicable, but injurious, by confining the immense sub-cutaneous extravasation and dangerous infiltration of venous blood that must ensue. T.]

It is finished in an instant ; and the youngest pupil can perform it with ease; the pain is almost nothing, and the whole operation differs but little from an ordinary bleeding. What is to be obtained by the ligature so much extolled by Home and Bécларd, except to make the operation considerably longer and more dangerous ? Why run the risk, in imitating M. Brodie, of an incomplete division of the vein, and of seeing the blood effused into the sub-cutaneous tissue, and forming there a nucleus and centre for phlegmon or abscess ? Is it the division of the skin that should ever disturb us after such an operation ? And who does not now know that the action of the air upon the veins is incapable of producing any of

those formidable accidents which have been so gratuitously imputed to it? As to the long and deep incisions recommended by M. Riche-rand, and formerly by J. L. Petit; and to excision according to the method of Celsus, and as Boyer has practised it, they never should be countenanced except for those cases where the varices form painful masses, or have given place, by their degeneration, to tumors that can only be removed by extirpation.

J. But above all other considerations, is it not allowable to have recourse to the mildest of these operations? For has not humanity a right to recoil from the danger of phlegmons, erysipelas, purulent abscesses, phlebitis, and all other accidents which have more than once followed in the train of the operation? Why should we not confine ourselves to a laced stocking or to a roller bandage, which securely supports the parts without making the patient incur any risk? These objections are more specious than solid. It is incorrect to say that varices left to themselves involve no danger. M. Girod, (*Journ. Gén. de Méd.*, t. XIX., p. 65,) in 1824, satisfactorily established this, and Petit (*Mercure de France*, Nov., 1743, p. 2418,) had already shown the danger of rupture of varices. Two patients of whom Lombard (*Plaies Récentes*, &c., 229) speaks, died from the effects of it. Chaussier has related an instance of the rupture of a varicose vein in a pregnant woman, which speedily caused death. Murat has given the case of a washerwoman, in whom death took place from the same accident. In 1827, a statement was made at the Academy of Medicine, of a man in whom it had a similar fatal termination. In 1819, I saw a countryman perish from the loss of blood twenty-four hours after rupturing a varix. The death of Copernicus is attributed to this cause. MM. Reis, Lacroix and Lebrun, (*Nouv. Bibliot. Méd.*, t. II., p. 275,) have each made known a similar fact. A pregnant woman to whom M. Forestier was called, also ran the greatest degree of danger.

Those bandages or gaiters that are recommended to every one, require care and precaution; they incommode more than is generally thought, give rise to excoriations and exudations, on different parts of the limb and are not, therefore, so perfectly free of inconvenience. Madame Boivin cites a case of a young woman who could produce a miscarriage at pleasure, by applying a bandage to her varicose legs. Those eczemas too in fine, and eruptions and ulcerations so difficult of cure, which are almost always produced as soon as the patient takes any exercise, and which inspire terror to the surgeon as well as to the persons who are afflicted with them can it be said they have never caused death in a single instance, nor never given origin to any dangerous disease, nor made it necessary to amputate the limb?

On the other hand, if it be admitted that after incision of the veins, there sometimes supervene phlegmonous inflammations, and engorgements of various kinds, and that phlebitis also may be produced, it is not the less true that all those accidents are rare, that for the most part they are easily subdued, and that moreover, we may almost always prevent them, if after the simple incision such as I have described it, we take the precaution while inflammation

is to be apprehended, to keep the limb enveloped in a compressing bandage from its extremity to its root; the presence in fact, of the varices themselves, endangers the liability to such accidents as much perhaps as the operation does.

## § II.—*New Methods.*

We possess, after all, at the present time, processes more simple than the preceding, to effect the obliteration of superficial veins. The experiments upon the acupuncture and ligature of vessels, which I described in this work in 1830 and 1832, brought about results which have since been adopted in practice. M. Davat and M. Fricke have proved, as I also have done, that a needle or a thread passing through each varix, and left for some days, is sufficient to effect its occlusion. I have myself devised a plan which is yet more simple. In place of perforating the vessel with the needle, I seize it, and raise it up in a fold of the integuments, with two fingers, in order to pass a pin below it, and form a kind of twisted suture, or one of circular construction. The vein is thus strangulated between the body of the pin, which should be strong, and the skin which the thread tends to divide backwards. We may thus place from ten to twenty pins in the same sitting, or at intervals of a few days, upon the principal varicose branches. No dressing is afterwards necessary. If we cut off the points of the pins, or apply a piece of linen or a containing bandage, it is only to prevent the possibility of the patient wounding himself while turning in bed. I remove the pins on the sixth, eighth, or even twelfth day, according as the vein appears more or less completely obliterated. The puncture closes soon, and in a few days after, the patient may recommence walking. When the portion of the skin included between the pin and the thread forms an eschar, we must wait for its separation, and treat the wound afterwards as for a burn of the fourth degree.

Nevertheless, we must not count on the efficacy of these operations, which can be performed only upon patients whose deep-seated veins have preserved their natural condition, and where the patients themselves desire the operation, and that the varices have produced effects that are calculated to interfere with the functions of the diseased part, or to compromise the general health. The cure at best, is rarely complete. The anastomoses soon reproduce the varices, and at most, prudence suggests that we should confine ourselves to the obliteration of the branches which are in the neighborhood of the ulcer or the eruption which alone have caused the patient to ask for relief. I have already performed on one hundred and fifty persons the operation which I have described; and up to the present time, no accident of a grave nature has occurred. A very small circumscribed phlegmon is the most serious one I have noticed. More circumstantial details, however, will be given upon this subject in the following article.

[The question of operative interference in the treatment of varicose veins, has been most ably considered by Dr. John Watson, of



this city, in his critical notice of Chelius' Surgery, published in the *American Journal of Medical Sciences*, Jan. 1848, p. 175. Dr. W. remarks:

"We hold that the danger incidental to operations on varicose veins, has less to do with the special mode of attacking them, than with the condition of these vessels at the time of operation; and that they should never be interfered with by any sort of operative procedure, whether that be the knife, the ligature, the pin, or the potential cauter, when in a state of inflammation."

Through the journal above mentioned, Dr. Watson's contributions on the subject of varicose veins, varicocele &c., have become widely and most favorably known to the profession. Their truly practical character entitles them to a conspicuous place in the surgical literature of these important affections. G. C. B.]

## ARTICLE II.—VARICES IN PARTICULAR.

Although varices of the lower limbs have almost exclusively attracted attention, all the other regions of the body are not less liable to be affected with this kind of disease. Wedel, (*Collection Académique*; partie étrangère, t. VII., p. 450,) speaks of varices of the upper extremities which gave place to dangerous hemorrhages by their spontaneous rupture. I have twice seen the arms, forearms and hands covered with varicose enlargements. A young man admitted into the hospital of La Charité in 1838, had from his infancy a varicose tumor (un peloton de varices) as large as the fist, between the angle of the jaw and clavicle on the right side of the neck. M. Champion informs me that he has seen a young lady who had a varix of the size of a small egg, under the tongue. I have met with a young person who had one of the size of the thumb under the superciliary ridge. I have in fact seen one in a man of about thirty years of age, situated upon the course of the sagittal suture, and which appeared to be connected with the longitudinal sinus in the falx of the brain. Baillie, Aliburt and M. Huguier (*Thèse de Concours*, p. 19) have given instances of them upon the cranium or jugular vein. Varicosities upon the nose, eyelids, and the entire face are far from being unusual. The chest also is frequently the seat of them. But the hypogastrium, the external genital organs, and the lower extremities are nevertheless their favorite localities.

If it is true that in the hypogastrie region the sub-cutaneous or deep-seated veins may acquire a volume so considerable, and intertwine and fold themselves in such manner as to resemble numerous leeches gorged with blood, as I have seen in three instances, it is also true that such varices scarcely ever create any solicitude either in the patient or the surgeon. In treating of hernia I shall speak of the danger which results from such varices when they spread in the neighborhood of the groin, or are prolonged in the form of cylinders or tumors as high up as the umbilicus.

We find in Theden (*Neue Bemerkungen*, etc., t. II., chap. 5, p. 75) an instance of aneurismal dilatation of the veins of the belly,

which appeared to have no influence upon the health of the patient. Theden also speaks of a vena cava whose dilatation might have given rise to the belief of a hernia of the heart. If operations are not practised upon the veins of which I have been speaking, it is not because the obliteration of these vessels, however enlarged they may be, are in reality dangerous. I have elsewhere given an instance of a vena cava descendens obliterated by a tumor at the apex of the chest. Dance (*Nouv. Bibliot. Méd.*, 1828, t. I., p. 451) speaks of a similar obliteration, which was accompanied by that of the subclavian veins and the azygos, without there having been any œdema or infiltration above. In the patient mentioned by Wilson, (*Expér.*, t. II., p. 336,) this obliteration had caused only a slight œdema in the face.

[Complete obliteration of the vena cava ascendens, has also been observed by Dr. Peacock, of Edinburgh (*Cormack's Journal*. Feb. 1843.) M. Gintrac has reported another in the *Gaz. Méd. de Paris*, March, 1844.) All the veins of the abdomen communicating with this vessel, were in a varicose condition. Both of those parents died of ascites. T.]

The external iliac veins were obliterated in a patient who had never been attacked with dropsy, which case has been published by M. Manec (*Nouv. Bibliot. Méd.*, 1827—28, t. I., p. 451.) Descot (*Affect. Loc. des Nerfs*, p. 124) mentions a case of the same kind from Béclard. We are indebted for another to Baillie (*Anat. Pathol.*, p. 20—22). In the case of M. H. Bérard (*Thèse* No. 23, Paris, 1826) it was the vena cava ascendens which was closed; so that there is scarcely perhaps a vein in the animal economy whose obliteration, and that without endangering life, has not been noticed. In some regions, where they are found externally, the varices might in truth be reached by the operations which have been described above; but in reality we occupy ourselves only with those of the legs and the external genital organs. It follows, therefore, that in treating of particular kinds of varices I shall confine myself to those of the abdominal extremities and the scrotum.

### § I.—Varices of the Lower Limbs.

All that I have said of varices in general, applies particularly to those of the pelvic extremities; I have only now therefore to point out what there may be of a special nature in the manipulation of the operation on these organs.

[Before which we take occasion to speak in this place of two extraordinary cases of varicose enlargement, or hypertrophy of the veins of the lower extremities, which have been observed in this country, and which are both now living, one an adult of about 60 as observed by Dr. Mott, the other a young man of about 21 which recently occurred in my own practice. There are perhaps not on record two more remarkable cases. Dr. Mott states that in his patient, who is a person of unusually tall and erect stature, and of stout frame and otherwise perfect health, but from habit and his profession much accustomed to walk or to be in the erect

position, the entire mass of venous trunks and anastomoses in the sub-cutaneous tissues are so enormously distended, that they seem to constitute in each leg from the toes to the hips one general diffused encasement of venous blood and aneurismal dilatation. Were it not for firm containing bandages in which both limbs are kept constantly enveloped throughout their whole extent, death would inevitably ensue from the continual danger of exhausting hemorrhage by the spontaneous rupture which the gravitation of the blood above would doubtless cause. When the bandages are momentarily removed, the veins fill up to such degree as to enlarge each leg and thigh almost to the dimensions of the body of an ordinary sized man. When the bandages are on, the power of walking slowly, though even that is much impeded, is not destroyed. This patient is of a highly sanguineous temperament and of very florid fair skin, though very temperate and regular in his habits, and tall, robust, remarkably straight and well made in his frame, and of unusually symmetrical proportions, though near 6 feet 6 inches high.

In the case of the youth, in my own practice, and who on the other hand is of unusually pale complexion and of delicate make and dark hair and eyes, indicative of that order of scrofulous temperaments, the disease is congenital, similar in some respects to the remarkable case only described by Breschet, but infinitely more extraordinary. The superficial veins of one leg only appear to be affected. The dorsum of the foot and the entire outer part of the lower leg are covered with their convolutions so thickly and to such extent as to resemble large worms intertwined in every possible tortuous and serpentine shape—making a perfect net-work. But about the ankles they form large reservoirs of several inches in length and near three-quarters of an inch in calibre. One of these also crosses the patella obliquely, where it may be seen and felt through woollen pantaloons, as large as the thumb and *slightly pulsatory*. It then proceeds obliquely upwards and backwards upon the outer part of the thigh. Here on the outer part of the thigh it forms a tortuous reservoir of *near an inch in diameter*. When lying down they all nearly disappear for the moment. The disease seems hereditary. The general health is unaffected. T.]

A. *Ancient processes*.—I. *Compression*.—When varices of the legs are treated by compression we generally envelop the whole of the limb in a roller bandage or a laced stocking, in order that the entire mass of veins may be supported in a uniform manner. M. Colles, however, a distinguished surgeon of Dublin, informs me that he has limited himself to making strong compression upon the internal saphena vein in the fold of the groin by a kind of circular pelote, and that he has by this means effected cures. This method appears to me so contrary to what we know of the progress of varices, that up to the present time I have not ventured to make trial of it. As however I have particularly remarked, that the garters though tied somewhat tight, did not always increase the size of the varices, and that compression made at the lower part of the leg only occasionally causes temporary engorgement of the veins of the



foot, and as M. Colles is a gentleman entitled to confidence, I shall take an opportunity to make trial of his method upon some cases that may offer.

II. Exeision, exsection and ineisions by the method of the ancients, or J. L. Petit, could be practised upon the legs as well as in any other region. The same remark applies to the ligature and exsection. Vesicatories employed, it is said, (*Chir. des Hôpitaux*, t. II., p. 392. Hugier, *Thèse de Conc.*) in St. George's Hospital, London, would require no special directions in these cases.

III. *Transverse Section*.—In order to divide the veins of the lower limb by the most simple process, it would be necessary that the leg and thigh should be in a state of relaxation. The surgeon then seizes the vein in a fold of the skin above its swollen portions; holding this fold by one of its extremities with the thumb and forefinger of one hand, while an assistant raises the other extremity in the same manner, it is divided transversely by inserting the point of a straight bistoury near its base and under the vein, and in such manner that the back of the instrument should be turned towards the limb. Performed in this way, the operation is prompt and but little painful. To arrest the bleeding a considerable degree of pressure is required upon the lower end of the cut vein. Balls of lint should be applied directly, or upon linen spread with cerate at the bottom of the wound; without that the continuity of the vein might be re-established and the object of the operation defeated.

There are no points upon the leg where this section cannot be performed. If the varices belong to the system of the external saphena, we are to look for the trunk of this last in the neighborhood of the ham. It is well to remark (Huguier, *Thèse*, p. 35) upon this subject that the *external saphena* is often composed of two principal branches: one, ascending, which belongs to the leg, the other, descending, which comes to it from the posterior region of the thigh, which branches unite to form a common trunk in the popliteal space.

When, on the contrary, the varices depend upon the *internal saphena*, it is below the knee and opposite to the pes anserinus and above the inner condyle of the femur that its section is to be made. For greater security, also, it would be advisable to divide each dilated vessel upon different portions of the leg. Without that there would be reason to fear that the innumerable anastomoses of the veins of the whole limb would ultimately reproduce the varices.

B. *New processes*.—All the new processes applied to varices of the legs may be referred to acupuncture, the ligature, or local compression.

I. *Acupuncture*.—The researches which I made in 1829, (Read to the Institute, the 27th of December, 1830,) having proved that it required only to keep a foreign body lying transversely through a vessel for some days to effect its obliteration, it was very natural that acupuncture should be soon applied to the treatment of varices. This method which M. Fricke and M. Grossheim (*Jour. des Conn. Méd.-Chir.*, t. II., p. 221, 1834) were the first to put in practice upon the living human subject, in cases of varicocele, is divided at

the present time into two processes, that of M. Fricke and that of M. Davat.

*a. Process of M. Fricke.*—M. Fricke has not confined himself to pure and simple puncture; if he perforates the vein with a needle it is in order to insert into it a thread in the manner of a seton. For that purpose the vessel is grasped in a fold of the integuments, as if it were with the view of performing the transverse section, or we hold it firm by placing the fore-finger and thumb upon its sides. Then with a needle armed with a simple thread we transfix it from one side to the other. In order to be more sure of obtaining inflammation we may pass in this manner two or three setons through the same vein at intervals of a few inches. The operation is repeated in this manner on each of the venous trunks that we wish to obliterate. If we attack the trunk of the saphena vein at two different points below the knee, and at two other points on the thigh, it will generally be rendered unnecessary to transfix the other veins of the leg, unless the system of the external saphena should also be implicated.

Each seton should then be tied separately and moved in the vein morning and evening until inflammation has supervened. We are generally enabled to remove them from the second to the fourth day. A deposit of plastic lymph is now effused in the neighborhood, the walls of the vein inflame, and it soon becomes impossible for the blood to flow there. If the inflammation is developed too rapidly, or becomes too intense, we first remove the threads and then reduce it by the ordinary means, but only in moderation so long as it continues to be local.

M. Fricke has written to me (13th of November, 1835) that the treatment of varices by threads or setons has always succeeded with him, and that in his hands it has never caused serious accidents. I have myself made trial of it on twelve patients: the veins became inflamed in all. Eight of them had local symptoms only, and left the hospital apparently cured; three others were seized with inflammation which extended along the veins from the foot to the upper part of the thigh, and which taking on the character of a phlegmonous erysipelas, terminated in large purulent collections: numerous incisions in the leg, ham and thigh became necessary, and these cases caused me much alarm. I will add that one of them came back to me eighteen months afterwards, and that his varices had re-appeared. Moreover the internal saphena which had been perforated by the threads was itself again dilated. The twelfth was still more unfortunate; he was a butcher's boy of extreme timidity, but also in excellent health. Symptoms of internal and external phlebitis, and angioleucitis soon supervened, ending in death at the expiration of eight or ten days.

Since this accident I have no longer indulged the thought of repeating the essays of M. Fricke who, however, in his letter, spoke only of varicocele. Two reasons combine to induce us to reject this process: 1. It is impossible that the inflammation which is thus designedly created should not sometimes become diffused and purulent; and then all the dangers of internal phlebitis and puru-



lent infection present themselves before the eyes of the practitioner ; 2, on the supposition that the operation occasions no serious accident, and that it effects the obliteration of the vein, it is next to certain that the circulation will frequently ultimately re-establish itself in the vessel and defeat the result of the operation. It is a process, in fact, which has nothing to recommend it but the promptitude and facility of its manipulation.

*b. Process of M. Davat.*—M. Davat, from researches of which he published a summary in 1833 and 1834, (*Thèse* No. 93, Paris, 1833.—*Arch. Gén. de Méd.*, 2e sér., t. II., p. 5,) was led to the conclusion that to cure varices with certainty, it was necessary to adopt the following mode:—A pin is first passed under the vein and through the skin from one side to the other. Raising up the vein by embracing this pin by its two extremities, the surgeon provided with a second needle, transfixes the vessel itself, from the skin towards the *deep-seated* parts, penetrating thus underneath the first pin, in order to pierce again through the same vein from the deep-seated parts towards the skin, in such manner that the two metallic stems cross each other at right angles. A thread then passed under their extremities serves to retain the whole in its place. This process, which was not put in practice on the living subject until after 1835, and which M. Norris, (*Philadelphia Med. Examiner*, April 1838, Exp., t. II., p. 112,) says he has made trial of with success in America, is invariably successful, according to the author, and never produces serious accidents. In the memoir of M. Davat, however, there are facts which disclose the danger of this method, and in the case of a man upon whom it was performed at the Hotel Dieu, in 1837, death was the consequence, (*Landouzi, Journ. des Connaiss. Med.-Chir.*, 1838, p. 97.) We cannot indeed understand how a pin left through a vein, would not produce phlebitis as soon as the presence of a thread, and every one knows that phlebitis is the principal danger in all the operations performed for varices.

If this process, however, is a little more difficult and embarrassing than that of M. Fricke, it ought also to be more certain in its result. The two pins, crossed, necessarily cause the ligature which passes under them to give a curve to the vein and to have a tendency to interrupt its continuity. There is, therefore, less chance of relapse by this method than with a simple seton. [M. Velpeau, in a letter to the Academy of Sciences of Paris, in vindication of his claim of *priority* for his method of treating varicose veins and varicocele, and a copy of which has been transmitted by the Professor of La Charité to Dr. Mott and myself, thus expresses himself under the head of *varices and varicocele* ; It was in the year 1840 that M. Davat (of Aix) alleged that I had availed myself of his process for the treatment of varices. This process consists in the passage of a pin underneath the vein we wish to obliterate, then of a second pin which crosses the first at a right angle, and which twice transfixes the vessel through and through and in the direction of its length.

I never (says M. Velpeau) employed the process of M. Davat,

and I never made any claim to its invention, although the two elements of which it consists are evidently based upon my researches on the subject of the acupuncture of veins, published in 1830. The proof that my process for varices does not belong to M. Davat, lies in this, that this physician himself speaks of it as follows in a memoir published by him in 1836, (*Traité Curatif des Varices*):—

“M. Velpeau, at La Pitié and La Charité at Paris, and M. Franc, at the hospital of Saint Eloi at Montpellier, have employed a method which, though as simple and innocent as mine, appears to us to be far from possessing the same efficacy. Already, in our first trials, though we occupied ourselves but very little with this mode of compression, because we were aware that it had been proposed by M. Velpeau, (*Médecine Opératoire*, 1832,) we made known some experiments which were but little favorable to it,” (p. 2.)

And further, (p. 20): “to the process of M. Velpeau there is in my opinion these objections, viz., its uncertainty unless the constriction is made with a sufficient degree of force and constantly, and because, in the contrary case, of its being attended with as much danger as the immediate ligature.”

We thus see (says M. Velpeau) that M. Davat, far from claiming this process, does himself attribute it to me, quotes it from me, and repudiates and denounces it five or six years after I had published it. T.]

II. *Compression.*—*Process of M. Sanson.*—Taking his idea from a process used for varicocele, and of which I will speak further on, M. Sanson (Brioux, *Thèse* No. 282, Paris, 1836,) has proposed a sort of *clasp* or forceps, by means of which he has attempted to obliterate the varicose veins of the legs. This forceps which the author (Boinet, *Gaz. Méd. de Paris*, 1836, p. 84.) appears to have often used with success, is not to bear on the vein itself. To apply it we endeavor to draw the vein into a fold of the integuments and place the bite of the instrument immediately below it. It results from this, that the vein is compressed by the skin which permits itself to be drawn and pulled backwards by the pressure of the forceps. What I have said of the return of the disease, after the use of the seton or pin, sufficiently shows that this kind of compression, though simple and attended with but little danger, cannot have much efficacy. For which reason, I have not thought it necessary to make trial of it.

*b. Process of the Author.* The ligature upon varicose veins is, as I have said, one of the most ancient methods. But if we adopt what Paul of Egina, and those who have described it formerly, say of it, we ought first to incise the teguments in order to lay bare or isolate the vessel. In this manner, the operation is as painful and as serious, as by the different processes of excision or incision. At the present time, we have in use other kinds of ligature.

Having devised my process in 1830, I first tried it upon animals, and confined myself in the first edition of this treatise to make only casual mention of it. I employed it for the first time in 1833, at the hospital of La Pitié for varices of the legs; since that time I

have performed it on more than a hundred patients. M. Franc, (*Thèse de Montpellier*, Mars, 1835,) who on his part thought that he was the author of it, also extols its simplicity.

1. *First Stage.* This process is performed with a pin for each vessel. It is advisable that this pin should be strong though well sharpened, and with a large but smooth head. A strong and well-waxed thread is also necessary. After having seized and raised up the varicose vein in a fold of the skin, we cause an assistant to hold one of the extremities of this fold, while we stretch the other ourselves.

2. *Second Stage.* The parts being thus arranged, and the vein completely pushed above the fingers, which should try to touch behind it, the surgeon transfixes the whole cutaneous fold with the pin, in passing it under the nails of his two fingers. The vein is then situated astride the pin, which it crosses at a right angle, without having entered its interior. We thus proceed upon two or three points of the saphena above the knee, and upon all the veins which are found dilated along the leg or on the foot. It may be necessary to use eight, ten, or even fifteen pins, successively on the same limb, though the insertion of two or three is often found quite sufficient.

3. *Third Stage.* In order to complete the operation, a noose of thread must be passed upon each of the pins, in order to strangle upon them as firmly as possible the veins to be obliterated. At first, I crossed this thread in the manner of a twisted suture, as in hare-lip; but having found how difficult it was to obliterate the vein, so as to prevent a return, I thought it advisable to adopt another mode. At the present time, and since the year 1837, I place the ligature circularly under the extremities of the pin, which an assistant is charged with raising up, while I strangle the tissues forcibly behind it. I thus obtain three constrictions which bear on three points of the vein, one which the pin effects from behind forwards, and the two others which are produced by the superior and inferior border of the circle represented by the thread, and which act from the skin towards the deep-seated tissues. For greater certainty still, I wait until the constriction has mortified its way through the small packet of tissues included in the thread; which happens in the space of from six to twelve or fifteen days. If, about this period, the eschar does not come away of itself, I remove the pin and also the ligature, being well assured that at time the vein is certain to have closed.

4. *Fourth Stage.* It is not the insertion of the pins which is painful in this operation; but it is the application of the ligature which seems to produce in some patients an acute degree of suffering. Nothing can be more simple than the phenomena which follow; often they are limited to the mere mortification of the peloton of strangulated integuments, and unaccompanied with any marked inflammation. Livid-colored phlyctenæ, supervene, and the skin takes on a darkish or muddy tint. An inflamed line which afterwards becomes purulent and ulcerated forms under the ligature. The eschar is then isolated and separates as in a burn or contusion, and leaves exposed a sanious wound, which is cleansed



and cicatrized afterwards in the manner of ulcers or ordinary wounds. Often also a red, painful kernel, having the appearance of phlegmon, developed about each pin, at the same time that the strangulated vein becomes swollen and hardened and is transformed into a solid cord above and below. It sometimes happens that the inflammation proceeds on to suppuration, and gives rise to true abscesses.

[Mr. Erichsen is in the habit of placing a piece of wax bougie upon the vessel, and then applying the twisted suture around the pin, and over the bougie. He has also found it useful to make a sub-cutaneous division of that portion of the vein included between the pins, as recommended by Mr. Lee. This division is made after coagulation of the blood has taken place, and, as he asserts, it insures the obliteration of the vessel. G. C. B.]

5. *Fifth Stage.* The pins having been once placed, the operation requires no dressing, and so long as there is no acute inflammation we may allow the patient to get up and take some exercise. At a later period it may be required to use leeches or topical applications, emollients, or resolvents; and so also when the pins are removed, each region that they occupied must be treated as a small abscess or burn. It is unnecessary to add that immediately after the operation the point of each pin should be snapped off by means of a cutting nippers, or a pair of stout scissors, and that to prevent our wounding the fingers in applying them, it is advisable to make use of a thimble or a piece of thick linen. These precautions would be unnecessary, if we had pins with the heads well rounded, and of a metallic quality sufficiently solid to allow of their being well sharpened and reduced to a small size. (See on this subject: Houel, *Bulletin de Thérapeut.*, t. XIII., p. 145; Dupresse, *Journ. Hebdomad.*, 1836, t. I., p. 257; *Bulletin de Thérapeut.*, t. II., p. 59-62, t. XIII., p. 108, Septembre, 1837; *Journ. des Conn. Med.-Chir.*, t. III., p. 20; also May or June, by M. Helot; *France Med.*, t.—, p. 56; Brioux, *Thèse* No. 282, Paris, 1836.)

6. Whenever the veins are rolling and moveable under the skin, the operation which I have described presents no difficulty; but it not unfrequently happens that we find them too closely adherent against the inner side of the tibia, the dorsum of the foot, and the neighborhood of the malleoli, to allow of our raising them in a fold of the skin. In that case, we must insert the pin almost perpendicularly upon one of the sides of the vein, then incline it so as to slip its point underneath, and make it come out from within outwards, upon the other side. The pin in such case should possess considerable strength; otherwise, we should soon find its two extremities bend or raise up under the pressure of the ligature, especially when using the circular constriction in preference to the twisted suture.

7. A precaution also to be attended to, in all the processes to be employed for the cure of varices, is that which relates to the position in which the patient should be placed at the time of the operation. In order that the veins may attain their full size and be rendered prominent, it is advisable that the limb should be held in a pendant position. If the teguments are pliant, and the sub-cutaneous

neous tissue but sparingly supplied with fat, this position will not interfere with our obtaining a grasp upon the veins, or in any way incommode us in the application of the pins. In individuals, however, who are fat, and in whom the skin is tense, the case is very different. The veins in such persons lie close against the aponeurosis and the bone, and it may be impossible to grasp them in a fold of the integuments. In such cases, we select with care the points where the pins are to be placed, while the patient is in the vertical position. We then place him in a recumbent posture, and while the limb is in a state of semi-flexion, pinch up, between the thumb and fore-finger, the vein, which is recognizable under the skin by its form, resembling that of a cord, as if it were a woody substance. I should remark, moreover, that it is best to begin by strangling the vein around the upper pin, as the nervous filaments, which might possibly be included in this upper ligature, would render the pain of the others less acute.

8. The application of a ligature to the veins, by entwining it around a pin, is an exceedingly simple operation—one that produces no more pain than any of the others, that all patients bear without any inquietude, and one which any person has it in his power to perform. As it is one also which mortifies and destroys a portion of the vein, it ought to be as effectual and complete as any of those that have been made trial of up to the present time. The object of all surgeons, in this matter, is to obliterate the vein operated upon; but the process of the pin accomplishes this result with as much certainty as excision, and in a more perfect manner than acupuncture or local compression. With respect to dangers, I have as yet made trial of no method which is attended with fewer than this. Out of more than one hundred patients, upon whom I have employed it, not one has died. I may add, also, that not one of them was exposed to any real danger. The worst that did happen, was an external phlebitis and a phlegmonous kernel.

The only objections that might be made to it, are, that of incurring the risk of passing the pin between the integuments and the vein, and thus completely frustrating the object in view; also that of allowing in some cases the vein, at a later period, to reacquire its permeability, where the strangulation has not been applied at a sufficient distance. But these inconveniences belong, in a still greater degree, to acupuncture by the process of M. Frické, and also to the method of M. Davat. The different modes of incision, also, are not free from these objections.

Adopting my process for the treatment of varices, M. Liston says he has succeeded in removing the pins at the end of forty-eight hours. I am the more astonished with this result, because experience has taught me that ten to fifteen or eighteen days were really necessary effectually to obliterate the vein thus strangulated. Varices have been treated successfully by M. Melvin, (*Encyclogr. des Sc. Méd.*, 1839, p. 275,) by means of the pins and the twisted suture. Apprehending that the strangulation, whether by my mode or that of M. Davat, might not be sufficient to obliterate the veins, M. Bonnet (*Thèse*, No. 5, Paris, 1830) combines cauterization by

potash to the treatment of varices by pins. The process of M. Gagnebe, (*Archiv. Gén. de Méd.*, Mai, 1839, p. 30,) which I explained in 1832, and which consists in passing a thread around the vein under the teguments, by a simple puncture of the skin, has, it is said, succeeded in the hands of M. Ricord, (*Gaz. des Hôpit.*, 12 Juin, 1839.)

*c. Process of M. Reynaud.*—A surgeon of Toulon, M. Reynaud, (*Gaz. Méd.*, 1837,) after modifying the process by the ligature which I have described above, adopted, in some of his cases, the following method: Passing a needle, with a thread properly waxed, under the vein and through the skin, he proceeds to tie the two ends, and to fasten them by a bow-knot upon a roll of diachylon plaster, or a small graduated compress. This appears to be the indirect (mediate) ligature which Chaumète (*Exchirié. de Chir.*, p. 278) and Lombard, (*Plaies Récentes*, etc., p. 549,) employed, and of which these authors had already given an imperfect description. As the thread may be untied at pleasure, it allows of being again tightened every day or other day until the vein is divided. There is no doubt that we may succeed by operating in this manner; but the obliteration of the veins by this mode of division is so difficult, that there is always danger of their continuity and circulation being re-established. The process by the pins, which is at least as simple and as easy, and which also allows of increasing the constriction at pleasure, appears to me to be still preferable.

C. I must not, however, terminate this article, without adding, that such processes are still too new to enable us to judge of their comparative value, with a full knowledge of the causes.

On the other hand, practitioners should bear in mind that varices of the legs are far from always yielding to these modes of cure. Thus, though one of the dilated veins may be obliterated, three or four others will soon reappear. Owing to the branches of the external saphena communicating with those of the internal saphena, and the superficial veins anastomosing with those that are deep seated, the venous system of the abdominal extremity represents a vast net-work, whose circulation it is next to impossible to interrupt, and which, whatever we may do, will always render the complete success of these various operations exceedingly problematical.

[VARICOSE VEINS.—The *mediate or indirect application of the ligature to varicose veins*, the saphena and spermatic for example, as lately much commended by Dr. Pagani,] *Gazetta Medica de Milano*, November, 1844; see also Cormack's *Lond. & Edinb. Month. Journ. of Med. Sc.*, Feb., 1845, p. 140,) and which consists, after passing the ligature by a curved needle under the raised vein and fold of the skin as above described, in tying the knot on a small rouleau of linen, placed on the skin, is a very ancient practice revived, so far as relates to this indirect pressure on an artery, (See this present vol., also vol. I.) In varicose veins, the pressure thus sought for externally is equally well, if not more completely and effectually obtained by the sub-cutaneous, and, as it may be called, the *sub-venous* methods, combined, as practised by M. Velpeau.



Through means of direct linear pressure, sub-cutaneously exercised by the pin from within and outwards, and the corresponding pressure from the circular threads externally, embracing the head of the pin, our purpose of the gradual division and cicatrization of the vein is much better fulfilled.

*Varicose Veins in the Pudenda.*—*Death by Hemorrhage.*—The *pudenda* themselves are not free from a varicose enlargement of their veins, which in one case, related by Dr. Hesse, (*Medicinische Zeitung von Preuss.*, Vercin No. 48, Nov. 30, 1842; also, *Cormack's Journal*, Feb. 1843, p. 158—159,) proved fatal by sudden and excessive hemorrhage, near the termination of a fifteenth pregnancy. The Cæsarean operation was performed a few months after the death of the mother, but the child was also dead. The uterus appeared to be ensanguined, and in the left labium, which was large and flabby, there was an opening of about half an inch in length, from which black tar-like blood was readily expressed. This opening led to numerous venous canals, both laterally and inwards, deep into the perinæum. The husband informed Dr. Hesse that his wife had long labored under a great enlargement or swelling of the left labium, which, as it appears, was nothing more than an enormous varix. T.]

## § II.—*Varicocele.*

The word *varicocele*, employed, like that of *kirsocele* or *cirsocele*, to designate the dilatation of the veins of the scrotum, though applicable to every tumor formed by veins, is, however, exclusively confined, at the present time, to the dilatation of the veins of the spermatic cord. *Varicocele*, though a very common disease, and noticed principally between the age of fifteen and that of forty, that is, during that period of life when the genital organs possess all their activity, is almost all confined to the left side. It is rare, however, that serious consequences result from it. The swelling, inflammation, suppuration, and atrophy of the testicle, which some authors have attributed to it, do not happen in one in a hundred, perhaps in not one in a thousand cases; and I can scarcely comprehend how modern surgeons should have so far misconceived this subject, as to consider a disease dangerous which, in 99 cases out of 100, constitutes but a slight infirmity. The usual inconveniences are only a slight uneasiness, a drawing-down pain in the loins and in the groin or scrotum, together with a slight numbness of the testicle. To which I may add, that an immense majority of persons who are affected with it, may have it all their lives without being aware of it.

These preliminaries being established, we shall be enabled to understand to what extent *varicocele* may be subjected to surgical operations.

A. *Ancient Methods.*—All the old processes which I have pointed out under the article of *varices* in general were applied formerly to *varicocele* itself. Cauterization with slender-pointed rods of iron, and with chemical caustics were made use of at the time of

Celsus, (*De Re Med.*, lib. VII., cap. 32.) The ligature, excision, incision, and extirpation, which also had their partisans, are likewise mentioned by Celsus. Paré (Liv. VIII., chap. 18) proposes that after having passed a double ligature underneath, we should fix one of the threads at the upper and the other at the lower part of the varix, in order to incise the veins between the two ligatures, and afterwards to dress the entire wound as in the case of an ordinary varix. Paré (Liv. XIII., chap. 30) expresses himself to the same effect about varices of the legs. Cumano (Mouton, *Dict. des Scien.-Med.*, t. V., p. 261) had recourse to extirpation as well as ligature upon the varicocele. After having made a long incision through the integuments and penetrated to the cord, this surgeon isolated the tumor which he tied above and below before excising a large portion of the serotum. The upper ligature came away on the twentieth, and the lower on the thirty-fifth day; but the wound was not completely cicatrized before the fiftieth day.

I. Like Celsus and Paul of Egina, Delpech, (*Lancette Française*, t. III., p. 24,) laid open the serotum, exposed the cord, isolated it, and tied or incised its veins. By this method he cured, it is said, six cases out of seven; but abscesses and sometimes death were the consequences. It is also known that Delpech, (Gaspard, *Thèses de Montpellier*, 1832,) who sometimes confined himself to introducing and securing a piece of sponge under the dilated veins with strips of adhesive plaster, was assassinated by a patient upon whom he had thus operated.

II. M. Warren writes to me that he has often excised or tied varicocele with success, and M. Moulinié (*Bulletin Med. de Bordeaux*, 1833, p. 57,) who has no apprehension of incising the tissues even from the inguinal ring to the lower part of the serotum in order to tie the dilated veins of the cord, and to divide them above, maintains, as does also M. Rima, (*Gaz. Méd.*, 1737, p. 234,) that this mode is still preferable to all others. In fact it seems very clear to me, that the accidents which have been imputed to all these methods have been singularly exaggerated; that inflammation and abscesses of the serotum are, with some rare exceptions, all the results that they can in any case produce. If, therefore, Dionis, and in our own time, Boyer, (*Malad. Chir.*, t. X., p. 233,) and all discreet surgeons have rejected them, it is less on account of their real danger, than because of their insufficiency, or the benign character of the disease.

III. As to the proposition to lay bare the cord, in order to tie the spermatic artery, which M. Bell approves of, and some surgeons (Arch. Gén. de Méd., t. XIX., p. 461, 462, 614,) have practiced, which M. Maunoir has performed for sarcocele or to excise a portion of the vas deferens, as has also been done by MM. Morgan, (*The Lancet*, 1828, Vol. I., p. 251,) Lambert and Key, (*Ibid.*, Vol. II., p. 476;) it is an operation the propriety of which we have no need of discussing at present while treating of varicocele.

IV. *Castration*, which is an operation that Celsus reserved for cases where the testicle itself was the seat of varices, and which



Boyer (*Malad. Chir.*, t. X., p. 234) also sanctions where varicocele becomes in reality a serious disease, cannot in the present day be indicated in any presumable case, except that of complication.

V. In fact, if surgery were to confine itself to the ancient processes, it were better to abandon varicocele to itself, and to moderate its development and inconveniences by means of topical astringents and good suspensories. The exceedingly rare cases in which it manifestly has a tendency to produce disorganization in the testicle, would be the only ones which would justify the conscientious surgeon in having recourse to such operations.

B. *New Processes.* In devising the new processes of which I have already previously spoken, surgeons at the present time had varicocele chiefly in view. The processes, now six in number, are those of MM. Davat, Fricke, Breschet, Sanson, and Reynaud, and that of my own. Based upon my researches, on the acupuncture of veins, they have come into practice in the following order:—

My experiments made in 1829, were published in 1830, (*Gaz. Méd. de Paris*, Janv., 1831; *Lancette Française*, Janvier, 1831; Journ. Hebd. Univ., t. I. et II.) M. Davat made his known in 1833, (*Thèse Citée*, 1833,) and it appears to have been in the beginning of the year 1834 that M. Fricke introduced his mode into practice. M. Breschet (*Gaz. Méd. de Paris*, 1834, p. 33,) communicated his to the Academy of Sciences in January, 1834. Mine had already been applied to the human subject about the close of the year 1833. It was not until 1835 or 1836 that M. Sanson (Boinet, *Gaz. Méd.*, loc. cit.,) proposed his forceps. Finally, in the year 1837, we have the process of M. Reynaud, (*Gaz. Méd. de Paris*, December, 1837.) These processes, though originating from a common source, differ so much from each other, that there is no necessity of discussing their priority.

I. *Process of M. Fricke.*—In order to perform the operation proposed by M. Fricke, the patient is placed on his back, unless it should be advisable that he should be kept in the erect posture or upon his knees for the purpose of increasing the dilatation of the veins. The surgeon then proceeds immediately to search for the principal varices of the cord. Having seized them with the thumb and forefinger of the left hand, he inserts through them an ordinary needle, or as M. Fricke advises, a needle made expressly for this purpose, and armed with a single thread. If the vein is long we pass the needle through it a second time an inch higher up or lower down, and we do the same with each of the other veins whose size appears to be enlarged. The threads remain there in the form of setons for one, two or three days. We then remove them in order to prevent too active an inflammation. During the time the patient remains in bed the scrotum is supported upon a small cushion and kept covered with resolvent or emollient applications, according as the inflammation should appear to be more or less active.

This process, which M. Fricke had already employed successfully upon 38 patients when he wrote me in 1835, appears to be liable to a number of objections. In inflaming the interior of the

veins which penetrate directly into the abdomen, it incurs the risk of producing a phlebitis which it might not be possible to control and which might speedily prove mortal. Moreover varicocele is never constituted of a single vein, and the tissues of the serotum are too moveable and too supple to enable us to be perfectly assured when we have placed setons in the veins, that we have perforated all of them and that none have escaped. In fact the circulation might evidently be re-established in some of the veins themselves that have actually been transfixed, and thus allow the varicocele to be reproduced.

So also the needle may miss the veins we wish to hit, the permeability of those it has traversed may be afterwards re-established, and if phlebitis should supervene it is of course exceedingly dangerous. This then is a process which should be rejected.

II. *Process of Davat*.—M. Davat, like the surgeon of Hamburg, first seizes the veins of the cord with the forefinger and thumb of the left hand. He then inserts under them a first pin transversely, then a second through the vein in such manner as to make it pass under the first pin before its point emerges on the opposite side, so that we form in this manner a cross, one of whose branches twice transfixes the vessel. If some of the veins at first have escaped they are treated in the same manner. Nothing remains but to introduce a sort of ligature under the pins so as to strangulate the vessels. It does not, however, appear that M. Davat has yet applied his process to the treatment of varicocele. He has hitherto employed it only for the veins of the leg; but it is liable to the same objections as that of M. Fricke. Nor should we have more certainty of transfixing all the varicose veins of the cord with the pin than with a needle or seton, and it is evident that one of these bodies exposes as much to internal phlebitis as the other. The only advantage in the process of M. Davat might be in thus associating a sort of external constriction with acupuncture, the possible chance of strangulating the veins which have not been pierced, and perhaps, also, of thereby restraining the progress of the phlebitis. It is, however, singular that M. Davat who had used my process alone in the year 1831, as the first stage of his own, (*Petit, Journal de Med. et de Chir. Prat.*, &c., 1831,) has since persisted in rejecting it as insufficient. (*Thèse citée*, p. 24.)

III. *Process of M. Breschet*. M. Breschet employs neither setons nor pins (*Gaz. Med.*, 1834, p. 33) for the cure of varicocele. The method of this surgeon consists in strangulating all the dilated veins together with the envelopes of the serotum, by the branches of a species of forceps. This forceps designed after the manner of that which Dupuytren contrived to remove the salient angle of the intestine in artificial anus, has undergone modification by M. Landouzy, (*Jour. des Conn. Médico-Chir.*, Mars, 1838,) which renders it at the present day exceedingly simple. To apply it we commence by isolating the veins in the cord as completely as possible from the vas deferens and spermatic artery. Placing the extremity of the branches of the instrument between these two orders of bodies, we immediately approximate them together by

means of a screw or ring so as to compress and embrace the varicose bundle only. The whole is thus left in place and the patient kept at rest. The compression is afterwards increased each day, until it is no longer possible for vitality to be maintained in the portion of tissues which has been strangulated. The forceps is not to be removed except with the eschar. The loss of substance which results from this, and which in the first process of M. Breschet sometimes exceeded two inches in length, leaves a wound which gradually diminishes and cicatrizes after the lapse of six weeks or two months.

With any kind of forceps whatever applied upon these principles we necessarily interrupt the continuity of the veins, and as they are all strangulated, we have thereby a fair prospect of effecting a radical cure of the varicocele. M. Landouzy (*Journ. des Conn. Médico-Chir.*, 1838, p. 88) avers that more than 100 patients have been cured in this manner. The forceps of M. Breschet however is annoying to the patient; an eschar so extensive endangers erysipelas, phlegmon, and abscesses in the scrotum, while there results from it an enormous ulcer of great length and difficult to heal. Nor can we perceive why phlebitis might not occasionally be produced by it, or why the testicle and the generative function have less to apprehend from this operative method than from the others. It is certain that some of the patients who have submitted to it and have come to consult me, make great complaints against it. Moreover this process with all its apparent simplicity has much analogy in fact to that of Cumano; and if it is to be regarded as one of the most efficacious, there is room at least to hope that we may discover others that are more simple.

[M. Sedillot states in his *Traité de Med. opératoire*, Vol. I, p. 295, that he is acquainted with a young man, whose scrotum is covered with deep and extensive cicatrices made by Breschet's forceps, and yet the varicocele is not at all diminished. G. C. B.]

IV. *Process of M. Sanson.*—Being desirous, above all things, of avoiding the danger of phlebitis, M. Sanson proposes to obliterate the vein by the concretion of the blood, much rather than by an actual inflammation. The forceps he uses is so constructed that the extremity of its points exercises a compression stronger than the rest of its branches. It results from this that the varicose bundle is found to be confined by it in a fold of the integuments, and compressed only to the degree required to prevent the blood from passing through it. This fluid having ceased to circulate, solidifies, contracts, adhesions, and ultimately blocks up completely the strangulated veins. As, by this method, we have neither eschar nor wound, the process of M. Sanson would be infinitely superior to that of M. Breschet if it was equally effectual; but I am convinced that it would not enable us to procure a permanent obliteration of the veins. So long as the vein has neither been divided nor inflamed in its interior, the blood which closes it has a tendency to be re-dissolved; gradually it becomes fluid, and in a short time we find that the channel of the vessel is reopened. Something, in fact, more effectual is required to obtain a radical cure of varicocele. I have seen but one patient who had been treated by this kind of forceps: he was a student of medicine, and the varicocele, at the end of two months, had resumed its former size.



V. *Process of M. Reynaud*.—When we wish to adopt the method of M. Reynaud, we gather together, as in the processes above described, all the varicose veins in a fold of the integument, in order that we may introduce behind them a strong ligature by means of an ordinary curved needle, which pierces the skin twice. For greater security it would be advisable to pass in this manner two ligatures at about an inch apart. We then tie them firmly upon a small graduated compress, a piece of linen, a rouleau of diachylon or a dossil of lint; and in order to be able to relax or tighten them at pleasure, we fasten each of the ligatures by a simple bow-knot. It happens necessarily that the ligature, by the constriction which it produces, divides the strangulated veins from behind forwards. After that takes place, it is to be removed, and this completes the operation. There is nothing more to do than simply to dress the wound which results from it, and to await the cicatrization.

The process of M. Reynaud has more simplicity and despatch, and less danger than that of M. Breschet; and I have no doubt that it may, and will often, succeed. Nevertheless, the section of the veins by a single ligature, is too nearly analogous to their division by the bistoury, not to incur the danger of the re-establishment of their continuity, and the reproduction of the varicocele. By means, also, of the intervention of the small cushion recommended by M. Reynaud, the section, and likewise the obliteration of the veins, must necessarily be much retarded and difficult to effect. Nevertheless, this process is one of the best that has been devised.

[Prof. Gross has reported in the October number of the *Amer. Journ. Med. Sciences*, 1848, his method of treating varicocele, which consists in making a vertical incision through the anterior part of the serotum, and separating the enlarged veins from the accompanying duct, artery and nerves. A needle is then passed beneath, and a ligature applied over the veins with great firmness. The wound is closed, and at the end of 24 or 36 hours, when the blood is sufficiently coagulated, the veins are divided by a subcutaneous incision. The result in numerous cases in which he has adopted this method, has been most gratifying. G. C. B.]

VI. *Process of the Author*.—Struck, like most other practitioners, with the uncertainty or the dangers presented by the ancient modes of treating varicocele, I asked myself the question in 1830, if it might not be possible to substitute for them the method which I had made trial of on animals, with the view of obliterating the vessels. The conclusion I had arrived at, that a pin, needle, thread, or any foreign body whatever, left at rest from one to four days transfixed through a vein, arrested the circulation there with as much certainty as a ligature, naturally led me to try the processes which MM. Davat and Fricke proposed at a later period. But recoiling before the dangers of phlebitis and purulent infection, I conjectured that the venous bundle, strangulated upon a pin, might not be less efficacious, while at the same time it would be a protection against such results.

a. *Position of the Patient*.—The patient may either stand in the erect posture, rest upon his knees, be seated, or lie down. This last position, preferable in every other respect, has the inconvenience of not permitting the varicocele to be so prominent. It is necessary that the

serotum should have been previously shaved. The surgeon commences by identifying the vas deferens, which, situated in the rear of the cord, presents itself there under the form of a hard, elastic and regular stem of the size of a crow's quill, and the compression of which causes a pain similar to that produced by any pressure upon the testicle.

*b. First Stage.*—Having satisfied himself upon this point, the upper part of the serotum is seized behind, while care is taken that the thumb and forefinger have a firm hold upon the vas deferens, and that the vein in front remain free. With the thumb and forefinger of the other hand we then draw towards us, and isolate the venous bundle while approximating it more and more to the integuments, in such manner that, being thus temporarily transformed into a sort of membrane placed edge-ways (*de champ*) on the side of the serotum, it encloses the veins in its anterior margin, and the vas deferens in its posterior border. The fingers remaining fixed between these two borders, serve as a point of support for the passage of the pins. An assistant seizes and holds one of the extremities of the tegumentary fold between the two orders of organs mentioned, while the operator holds the opposite extremity.

*c. Second Stage.*—Having besmeared the point of the pin with some unctuous substance, the surgeon inserts it transversely under the veins, and as near as possible to the anterior portion of the cutaneous border, and passes immediately a noose of thread under its extreme points. Another pin is placed in the same manner, at the distance of an inch from the first, and the operation is terminated. Although we may, if necessary, commence by the pin above, I would advise, nevertheless, to insert that below first, since it is always easier to find at this place, the space which separates the veins from the vas deferens, than it is in the vicinity of the ring. It is, moreover, important to avoid the two extremes, of placing them too high or too low, or too near or too far apart; if too near the testicle, the lower pin might pierce the tunica vaginalis, and give rise to a purulent inflammation, or an abscess in this small sac; if too near the ring, we might run the risk of not entirely separating all the veins of the cord, and of allowing some of those behind to escape; if too near together, the two pins might ultimately form but one wound, which would then be too large and too difficult to heal; to place them at a greater distance apart than I have recommended, would require them to be fixed too near the testicle below, and too near the inguinal canal above.

*d. Third Stage.*—As I have said in the article *Varices*, I have long been in the practice of strangulating the veins upon the pin, as in the suture for hare-lip; but in the fear of not effectually obliterating the vessel, I have adopted the plan of employing circular strangulation for varicocele, as well as for varices in general. An assistant consequently seizes the pin by its two extremities, and raises it with sufficient force. If he is afraid of pricking himself, or if the operator requires more room, the fingers of the assistant may be replaced by an erigne with a double blunt hook. In whatever manner the pin may be raised up, it is necessary to flatten down on the sides the tissues which it embraces. A cord of two or three threads waxed together, is immediately placed first above, and then brought below the pin. Its two portions being passed like a simple knot, one over the other, are then drawn together with

force, in order to strangulate circularly all the parts behind the pin, which latter by this means projects forward, drawing with it a noose of vessels. The point of the pin being snipped off by means of a cutting nippers, the operation is finished. It is also a matter of little consequence whether its head is turned in this or that direction.

*e. Fourth Stage.*—We may, if so disposed, withdraw the pins at the end of five or six days, and then leave the wound to cicatrize; but it is more secure to wait until all the strangulated tissues are separated under the form of an eschar. During that time, the patient may go about and pursue his ordinary mode of life. If the inflammation should be moderate, it is not even necessary to make any topical application to the scrotum. After the fall of the eschar, the ulcer which results from it should be treated like a burn in the fourth degree. The whole of the treatment by this mode lasts nearly a month, and the eschar comes away, or may be removed, from the tenth to the twentieth day.

*f.* Fifteen patients, (September, 1838,) affected with varicocele, have been submitted by me to this operative process; they have all been cured. There are four of them whom I have seen repeatedly, and one of these was operated upon in 1834. They have not the slightest appearance of a return of the disease, and in none of them did internal phlebitis occur. I have twice seen abscesses form in the vaginal tunic, and that when I have placed the lower pin too far down. In two others, the cord assumed considerable development and hardness about the ligature, which was caused in one of the cases by violent excesses in his diet, and in the other, probably, because I have deemed it advisable, for greater security, to strangulate the tissues again on the thirteenth day. These accidents, which were unattended with any other results, were relieved without sensibly prolonging the period of the final cure. One patient only, a young man who was almost an idiot, and who left the hospital at the moment when the inflammation had reached its highest intensity, because I insisted that he should stop jumping all day in the courtyard and drinking to excess, went off without my ever being enabled to know what became of him.

*g.* In fine, I can conceive nothing more simple than this process. The operation, while it is exceedingly easy, is finished in a second of time, and causes scarcely the slightest pain. If we remove the constriction as soon as the veins appear to be obliterated, the patient may be free by the eighth day. If, to be better assured of a radical cure, we wait until the strangulated tissues are detached, there will be no room to doubt of its efficacy. It is a method, therefore, more convenient in its application, both for the patient and the surgeon, than that of M. Breschet. As to the accidents it may cause, they are evidently the same as those of any other mode of strangulation: in this respect it is proper to arrange this method in the same class with those of MM. Reynaud, Sanson, and Breschet. A thrust of the pin and a turn of thread constitute the whole operation.

[Prof. Mussey has been very successful with the following operation, the account of which we copy from the *Trans. Amer. Med. Association*, Vol. III. p. 377. In a recent interview with Prof. M. he informed us that he had employed it in nearly forty cases, with the happiest results. The hair having been removed from the affected side of the scrotum, the operator separates the spermatic vein from the vas deferens, and holds



it firmly in a fold of the integument, on the outer side of the scrotum, with the thumb and finger of one hand, while with the other he passes a straight needle, having a blade one seventh of an inch wide, with sharp edges and a long point, its broad surfaces looking upwards and downwards, armed with waxed saddler's silk, through both layers of the integument from before backwards, on the inner side of the vein, from an inch to an inch and a third below the abdominal ring. The thread being drawn in, the fold of the integument is raised from the vein, till the punctures are brought into apposition on the outer side of the vein, when the needle is brought back through the same punctures; both legs of the ligature now hang anteriorly, while the vein is included in its loop. A surgeon's knot is now made and tied firmly upon the vein. The wide and sharp edged blade of the needle makes an incision through which the ligature sinks down upon the vein, leaving the integument free. The ligature, composed of two threads of the silk, is strong enough to admit of being drawn very tight; the tension is kept up for a full minute or more before the reef or square knot is made upon the surgeon's knot. When the ligature is made thus tight, he had not known the pain to last more than five minutes. With the use of chloroform, the patient can scarcely be said to feel pain at all either during or after the operation. He applies collodion to the punctures, which seems to diminish the tendency to redness and thickening of the integument in their neighborhood. The scrotum is supported in a bag truss, and the patient kept in the horizontal position for two or three days, and directed to take light food. There is generally but little swelling resulting from this operation, never enough to require stronger local anti-phlogistic treatment than a compress moistened with water. The ligature comes away ordinarily within the month. G. C. B.]

VII. None of the modern methods of compression appear, up to the present moment, to have been followed by formidable accidents; while those by acupuncture, or incision of the veins, have frequently caused death. A fundamental difference, then, exists between these two orders of operative processes. By compression, either as M. Reynaud understands it, or with the forceps of M. Breschet or M. Sanson, or by the mode that I prefer, the coats of the veins inflame upon their exterior only; and their walls being held for a considerable length of time in contact, become adherent, and ultimately blended together, before the purulent secretion has had time to establish itself upon their interior surface. It is altogether the reverse in acupuncture or incisions. Here the pathological process which it is designed to bring about, establishes itself at the first—not on the external, but on the internal surface of the vein; from whence it follows that the pus, if any is formed, may mingle with the blood and infect the system. I should, however, remark, that internal phlebitis of the scrotum, spermatic cord, and penis, which I have often observed under circumstances disconnected with varicocele, has never been followed by that train of symptoms of poisoning which accompany it every where else. Can there be, in those regions, a particular arrangement of nature to prevent purulent infection; or were not the cases, observed by me, those of exceptions to the general rule? Certain it is, that the puncture of the

veins of the cord does not appear to have been attended, in the hands of M. Fricke, with those internal accidents which it has frequently given rise to when it has been applied to the veins of the limbs.

[A solution of gutta serena in chloroform has been highly recommended, for the purpose of giving support to the parts, and in mild cases, collodion might doubtless be occasionally employed with benefit.

G. C. B.]

[VARICOCELE—OBLITERATION, ULCERATION AND WOUNDS OF  
VEINS, &c.]

J. L. Petit (*Du Varicocèle, et de sa Cure Radicale*, par le Docteur J. Helot, Archiv. Gén. de Méd., Sept, 1844, p. 3) mentions a case of varicocele in which the bunches of dilated veins of the cord and serotum, had acquired in their aggregate volume the size of a child's head!

In regard to atrophy of the testicle which some have asserted to be a consequence of varicocele, the observations of MM. Breschet, Landouzy and Helot (Loc., Op. cit., p. 5) only go to show that the testicle on the side affected is softer and somewhat diminished in size. Another constant symptom according to M. Landouzy (Op. cit.) is an abundant cutaneous exudation from the side of the scrotum affected, and sometimes also a species of eruption, says M. Helot, on the corresponding part of the thigh, (Ib.)

The general opinion entertained, and which is corroborated by the observations of MM. Morgagni, Sir Astley Cooper, &c., and also by those of our author, M. Velpeau, (Vid. text supra,) that varicocele is far more frequent on the left than right side, because on the right side the spermatic vein enters the vena cava ascendens in a direction almost parallel with the axis of the vessel, i. e., with the course of the blood, while the left spermatic vein empties into the emulgent at a right angle, i. e., in a direction perpendicular to the current of the blood which comes from the loins, is contested by M. Helot. So also does this author deny the alleged predisposition to varicocele on the left side, because of the compression made on the operative vessels on this side by the stercoral matters accumulated in the iliac portion of the colon, as Callisen (t. II., p. 112) and J. L. Petit pretend. The cœcum, according to M. Helot (Loc. cit., p. 11,) ought to have a similar effect on the right side, in which location however varicocele is exceedingly rare. In relation to the pressure of these fecal matters on the veins of the cord, their effect too, says M. Helot, ought to be more pernicious when the patient is in a horizontal position, the reverse of which is the fact. Besides, a collection of these matters and constipation are not common in young men, who are the most frequent subjects of varicocele. He nevertheless admits the prevalence on the left side, but confesses his ignorance of the cause. Delpech even denies that varicocele is observed among young men, except in rare instances. M. Helot asserts that he is satisfied from the observations he has made at La Charité under MM. Velpeau and Ricord, that it occurs most frequently between the ages of 10 and 35, which agrees with the experience of M. Landouzy, (Loc. cit., p. 13.) Varicocele consists more, M. Helot thinks, in the abnormal development of the venous branches than in the dilatation of



the principal trunks. He does not consider it proved by any means that masturbation and excessive venery are a frequent cause of this disease, nor that it is more frequent in hot climates; since M. R. Marjolin in his Thesis (1837) establishes the fact that 60 out of every 100 in France have it to a greater or less degree. M. Helot also doubts with M. Ricord if blenorragic epididymitis be a common cause of varicocele. It is true however, he thinks, that varicocele as M. Blandin asserts (*Diet. de Méd.*) may be transmitted by an hereditary predisposition. A diagnostic mark is the power of separating with the fingers each of the varicose cords, which are semi-fluctuating, knotty, and resembling a bunch of leeches, all upon, but distinct from, the testicle. He disapproves altogether of preventive surgical operations, and advises to leave the disease to itself or a suspensory.

The great point is to know when to operate and when not—nor should an operation ever be undertaken except in a case of extreme necessity which very seldom happens. The annoying pain must be subdued by palliatives, and is no more a reason for a surgical operation than the pain of corns is for amputating the toe.

When palliatives fail, and the tumor is enormous, and the pain so intolerable as to disable the patient from attending to his pursuits, and where the accidents are serious and imminent, there only is an operation justifiable.

In a case where a varicocele of inconsiderable size but of long standing, in a gentleman of education and otherwise of sufficient moral firmness, had by the continuance of pain greatly impaired his general health, and caused a permanent melancholy or hypochondria, Dr. Mott at his earnest solicitations was induced to remove the testicle on the side affected, which brought about a radical cure and entire restoration of strength and spirits and general health.

*Process of Rolling up the Veins, a New Process for the Cure of Varicocele, proposed by M. Vidal de Cassis.*—M. Vidal, having adopted the process of M. Reynaud, modified it in the following manner: a thread of silver was passed by means of a needle behind the spermatic cord in its fold of skin, and kept well separated from the vas deferens. This thread was knotted upon a small roll of bandage acting as a cushion; a canula was adjusted above the knot which answering to the stick of the old artery compressor, served from time to time to increase the constriction, or to diminish it when the pains were too severe. Towards the 15th day all the veins were cut by the thread, and to remove this, all that was necessary was to wait for the ulceration of the integuments, or to divide the cutaneous bridge under which the ligature was situated.

After employing this mode for some time he abandoned it as objectionable because of its not effecting a perfect cure, but on the other hand exposing to a return of the disease; since it interrupts the venous circulation at a particular point only of the spermatic cord, so that the circulation may thus be re-established in the obliterated veins. He now proposes the following method, (See account of his memoir, *Bull. de Thérap.*, Mai, 1844.—*Archiv. Gén. de Méd.*, Sept., 1844, p. 108, &c.)

1. A [strong] silver thread is passed behind the cord by means of a needle, as in the process of M. Reynaud as modified by M. Vidal.

2. Another silver thread [of less size] is passed in front of the cord

in the same manner and through the same openings. The venous bundle is thus placed between two threads, under the skin, [constituting a sub-cutaneous ligature. T.]

3. The two threads are twisted together at each of their extremities; "as this torsion is continued the two threads are more and more tightened, and tend to form a cord which makes a certain degree of resistance.

This metallic cord, in turning on its axis, makes traction during its movement of rotation, upon the parts included between the two threads which compose it. The veins are by this means rolled up upon this double thread, after the manner of a rope upon a capstan. The greater the number of turns made the higher the testicle mounts upward, while the laxity of the cellular tissue of the scrotum favor the movement of ascension."

4. Finally a small roll of bandage is placed upon the skin, and the two ends of the rolled up metallic cord are fixed upon this plug by another torsion, then a canula is passed underneath, as in the process of M. Reynaud modified as above by M. Vidal.

It will be better, M. Vidal says, to allow the threads to cut through the skin, for we shall then not only have a division of the veins of the cord at different heights, but also that of the superficial veins, running between the cord and the skin, the strangulation of which presents another obstacle against a return of the disease. M. Vidal appears to think that the radical cure of varicocele should be attempted in all cases, inasmuch as its continuance occasions more or less pain, and great fatigue from exercise, and sometimes serious inflammation, *atrophy* of the testicle, impotency, &c. On the other hand, the editors of the *Bulletin de Thérapeutique*, commenting upon this process, think that in a great majority of cases patients are made quite comfortable and free of pain, by properly contrived suspensories, [See in Vol. I. of this American Edition, a suspensory used with great advantage at the Seaman's Retreat, New-York. T.] While the surgical processes of a ligature upon the spermatic cord are known in two or three instances (and it has happened probably in several others,) to have caused death by phlebitis or other accidents; [in one case death by tetanus. T.]

Considering, therefore, the general harmlessness of this disease, surgeons prefer the palliative mode, or, if an operation is to be resorted to, they would recur then, and not till then, to the processes of MM. Gagnebé, Ricord, Reynaud and Vidal.

It is due to our author, M. Velpeau, to say that at the sitting of the Paris Academy of Medicine, Aug. 6th, 1844, (*Journal des Connaissances Médico-Chirurgicales*, Sept. 1st, 1844, p. 126,) he, as one of a commission to whom the memoir of M. Vidal above-mentioned had been referred, reported upon this new process of *enroulement de veines*, in which report it is stated that two of the committee had examined, at the Hospital of Lourcine, two patients upon whom M. Vidal had operated with success by his method. The reporter adds, however, that the process is not so simple as those that are known; that it is not more dangerous than the processes of MM. Breschet and Reynaud, (of Toulon;) but that it is at present impossible to decide if it exposes less to a return of the disease.

M. Curling (London Lancet, June 15th, 1844, p. 388) has cured

several cases of varicocele by making pressure at the external ring by means of the *moc-main* truss, whereby the gravitation or hydrostatic pressure of the blood in the dilated spermatic veins was prevented.

*Excision of all the lower part of the scrotum*, preserving to it its natural, oval convexity downwards, is another mode recently made trial of for the cure of varicocele, under the expectation that the permanent retraction obtained by the curtailment and diminution of this envelope, would effectually keep up the testicles, and ultimately by its compression, cause the varicose venous bunches of the cord to resume their normal calibres. The idea appears to have first suggested itself to our author, M. Velpeau, many years since, from having noticed the salutary contraction of the scrotum produced by the cicatrix left after an accidental sloughing of the teguments in a case at La Charité, in which M. Velpeau had operated on the varicose veins by his process with pins. However, he accords (See Report in the *Clinique Chirurgicale* in the service of M. Velpeau, à la Charité, in the *Journal des Connaissances*, &c., de Paris, Decemb., 1844, p. 223, &c.) the first conception and the priority of the operation of excision of the scrotum to M. Bransby Cooper of London, about the year 1840. From seeing a case at Paris, which had been operated upon by M. Cooper, though leaving a bad cicatrix, M. Velpeau was induced nevertheless to make trial of it at La Charité. If, however, we are to believe the statements in the report of M. Velpeau's Clinique, as furnished to the *Journal des Connaissances*, (loc. cit.) but which, from the rather acerb tone in which the commentaries of the anonymous reporter, M. A. G., are couched, must be received, we think with caution, M. Velpeau had at that time, viz., up to Nov. 14, 1844, performed this operation on *three* patients, in all of whom the contracted scrotum had again become elongated by the weight of the testicles and enlarged veins, in fact reproducing the disease in as bad a state as ever. It is due however to our author, to state his mode as it is therein given, (loc. cit.,) of performing what he denominates the *English Process*. The patient being laid on his back, the surgeon seizes the lower portion of the scrotum, and raises it up vertically, so as to crowd the testicles back, which he does without any difficulty, upon the pubis, in order to remove them out of the way of the instrument. He then stretches in a transverse direction the fold of scrotum which had been just raised up, and does this with such force, that it readily becomes transparent to the light. The limit beyond which the excision is to be made, is established either by means of the fore-finger and thumb of an assistant, or by two sounds, one on either side, which compress the fold of scrotum between them, and are kept firm upon it by having their extremities made fast. A few lines beyond this curved line of demarcation are inserted at short distances from each other, *ten pins*; and on a line a short distance beyond these again the bistoury rapidly makes the required excision, the thread for each pin being fastened around its extremities the moment after the knife has cut beyond the point where it is inserted. The sutured parts are then dressed with the perforated linen spread with cerate, and a compress and appropriate bandage. The cicatrization is usually completed in a few days.

[Dr John Watson, thus expresses his opinion of this operation (Sir Astley Cooper's) in the radical treatment of varicocele (Vid. *Pract. Obs.*



on *Rad. Treat. of Varicocele*, Amer. Journ. Med. Sciences, Oct. 1845, p. 317.) "When properly performed it is sufficiently efficacious; it subjects the patient to none of the serious consequences that too often attend every mode of operating that is addressed directly to the spermatic veins; it is less objectionable than the operation for ligaturing the spermatic artery; it gives rise to less suffering, and is more efficacious than Breschet's mode of indirect compression; it does not interfere with the functions of the testicle, which are necessarily destroyed by every other mode of operating;—and, if performed sufficiently early, before the disease has led to atrophy of the testicle, it may be the means of actually preserving the functions of this organ." Instead of a transverse incision at the bottom of the scrotum, Dr W. makes it in an oblique direction, its upper angle being over the situation of the external abdominal ring, and its lower angle somewhat beyond the *raphé* near the bottom of the scrotum on the opposite side. Union by the first intention, he thinks, is not of the importance supposed by Sir Astley and Mr. Key. G. C. B.]

*Pathological Diagnosis to be obtained from Varicose Veins.*—It would, *a priori*, as it seems to us, be a rational pathological inference to assert that where the venous trunks externally become hypertrophied on the abdomen to the extent that they sometimes do, though incomparably less so than on the lower extremities, that this disorganization resulted from some internal organic difficulty and obstruction; the same as the hemorrhoidal dilatations, tumors, and bleedings indicate to a certainty more or less organic derangement of the liver, lungs, and other viscera.

Thus we find a case related (London, Guy's Hospital Reports, October, 1844,) of a carpenter, aged 36, who, after manner excesses, was received into the hospital for ascites, and in the right side of whose abdomen the superficial veins had acquired the *size of the finger*. Death occurring shortly after abstracting a large quantity of a clear greenish liquid, showed an enlarged liver, but especially an enlargement of the right kidney, which was *four times* its normal dimensions, and filled with fungosities and tubercles of brownish, reddish, and yellowish color; while the vena cava ascendens was filled to the extent of 6 or 8 inches with a similar fungoid substance, extending into the right auricle, with thickening and degeneracy of the coats of the cava and other marks of extensive degeneration throughout the principal venous trunks of the abdomen.

WOUNDS OF THE VEINS, &c.—*The Lateral Sinus of the Brain Ulcerated.*—Mr. Syme, in a communication to M. Liston, which the latter surgeon referred to at a meeting of the Royal Medical and Chirurgical Society of London, April 11, 1843, (Cormack's Journal, Oct. 1843, p. 945–6,) states that he tied the carotid in a boy, for bleeding from the ear after suppuration. The patient died, and an opening was found into the lateral sinus just above where it passed into the internal jugular. Mr. Bloxam (*loc. cit.*) has also seen a case of an abscess communicating with a vein.

*Rupture of the Right Internal Jugular into an Abscess.*—As one of the evidences of the necessity of early preventing or removing all pressure by tumors, abscesses, &c., upon tissues so crowded as those of the



neck are with large arterial, venous, and nervous trunks, and other vital canals, as the thoracic duct, trachea, œsophagus, &c., we may, as a suitable illustration under the head of *veins*, in addition to what has already been said by the author on a still more important subject, viz., phlebitis, pus, and air in veins, &c., instance the case related by Mr. Alexander King of Glasgow, (Cormack's Lond. & Edinb. Month. Journ. of Med. Science, March, 1843, p. 1, &c.; the case belonged to Mr. John Brown, surgeon,) of death in a boy, aged four years, in consequence of an *actual rupture of the right internal jugular* into an abscess which had formed in this part of the neck after an attack of scarlatina. This abscess was preceded as is common in scarlatina, by an extensive tumefaction of the oblique chain of sub-cutaneous lymphatic glands, extending from the parotid to the scapular extremity of the clavicle. It broke of itself on the 16th day, by a small opening through which the contents of the abscess were freely evacuated, so that the swelling gradually subsided, until on the third day after this, blood was found to ooze from the aperture in a full stream. The walls of the abscess were very tense, and the tumor now about the size of a hen's egg was larger, the mother said, than before; it occasioned paroxysms of coughs and dyspnœa, and then became more tense and prominent. Pressure on the carotid did not alter its size, but on the tumor itself, brought on a fit of coughing immediately, without appearing to displace any of its contents. The pulse extremely quick and feeble, and occasionally intermitting; countenance pale and blanched. Pressure to the tumor by compresses and bandaging, in order to facilitate coagulation, was attempted; but, as it brought on incessant coughing, it was first abandoned, then tried again; but the tumor continued to increase the evening of the same day the surgeon had been sent for, on account of the hemorrhage. The tumor, in fact, now interfered so much, by its size, with respiration, that the bandaging had to be again relaxed; but upon removing this altogether, in order to proceed to an examination, the child was seized with a violent paroxysm of coughing, during which the anterior wall of the tumor gave way to the extent of two square inches. A thin coagulum, about the size and thickness of a crown piece, was ejected, followed by an immense gush of blood. "I instantly," says Mr. King, "introduced the first two fingers of my right hand into the opening, and surrounded the fingers and the tumor with cloths, and very little blood was afterwards lost, although my fingers could not get either to the upper or lower orifice, in consequence of the lower part of the tumor being covered by the parotid gland and sterno-cleido-mastoid muscle. When my fingers were first pressed into the abscess, I felt blood flow freely downwards from above, and propelled upwards with a great force, during each forcible extirpation. A state of syncope followed in a few seconds, and he expired shortly afterwards."

Dissection was made ten hours after death. The swelling had entirely disappeared, and the skin which had previously covered the tumor, had contracted in every direction, so that it could hardly be conceived that so much distension had ever existed. The tumor from the lobe of the ear downwards was divided into two sacs, which communicated very freely. The one extended below the digastric muscle and parotid gland, and to the base of the skull; while the other had

the parotid gland for its posterior wall, the sterno-mastoid muscle for its external, and the platysma, fasciæ and skin for its anterior wall. Dividing through the parotid, which was sound and healthy, and the posterior belly of the digastric, a distinct view of the course of the hemorrhage was obtained. *Nine tenths of an inch* (continues Mr. King) of the external wall of the internal jugular vein, commencing two lines below the base of the skull and extending downwards, was completely removed, as if by a sharp scalpel. The external wall, and even the margins of the opening, were perfectly healthy, and of the normal pearly white color. The common carotid was also perfectly healthy; so were the walls of the abscesses and all the surrounding tissues.

*Remarks.*—A case so unparalleled could scarcely have been diagnosed by any one. The attempt at a ligature would probably have ended fatally by hemorrhage before the lesion could have been cut down to and secured above and below it; while compression was defeated by the regurgitation or reflux of blood from the right side of the heart during the paroxysms of the coughing. Nor, (as Mr. King says,) could the ligature have been applied to the wounded vessel between the laceration and the base of the skull. Add to all which, the child, had the laceration been freely exposed, would probably have suffocated on the spot, from unavoidable inhalation of air into this large venous trunk. So no blame could any way attach to the surgeons. Professor Fergusson of London, (See M. Liston's recent memoir on a *variety of False Aneurism*) relates a somewhat similar case. In this also no operation was resorted to, because of the debility of the child, which died suddenly from hemorrhage. On dissection, the blood was found to have proceeded from an ulcerated opening in the *lingual artery* near its origin from the carotid.

Such facts should indeed, as Mr. King says, impress surgeons with the extreme danger of opening, as is often recklessly done, abscesses in the neighborhood of large vessels.

*Scrofulous Abscess with Perforation of the Jugular Vein, and death.* Dr. Hoffman, also (Caspar's *Wochenschrift*, March 30th, 1844—quoted in Cormack's Journal, July 1844, p. 632,) relates the case of a child aged five, in whom scarlatina was followed by abscesses in the chain of sub-cutaneous lymphatic glands, on the right side of the neck, and which glands, on both sides of the neck from the parotid to the clavicle are, as is well known, and as we have already said, usually found involved in severe inflammation and tumefaction in that form of eruptive fever. Though a certain suspicious tremor and bruit accompanied the fluctuation of the tumor, it was nevertheless punctured, when a copious stream of blood immediately issued out and revealed the true nature of the mischief. At first the discharge was of a dirty red color, doubtless from the admixture of pus, but soon changed to pure blood, terminating in a few minutes in death, notwithstanding the compressing means used. The corresponding *external jugular vein* was found *perforated like a sieve* to the extent of three quarters of an inch of its calibre, the portion of the vessel above and below this point, being also discolored and soft. The abscess being situated over the vein had in fact extended to its walls and perforated them. T.]

[Dr. Geo. McLellan states in his *Principles of Surgery*, p. 195, that in removing an inguinal tumor, he once divided the internal saphena vein, which required a ligature. He remarks that no inconvenience resulted, although the orifice of the vein was sufficiently large to admit the ring finger, being the largest which he had ever seen tied. This surgeon has also tied the internal jugular vein without any unpleasant effects. Mr. Fraser has reported in the *Lond. Lancet*, July, 1848, a case of laceration of the axillary vein, in which he applied two ligatures, one above, the other below the wound. The case terminated favorably. Dr. Nathan R Smith has tied the internal jugular vein, and his patient recovered. A report has recently gone the round of the journals, of a case in which the subclavian vein was successfully tied by a Mr. Hinckley of Massachusetts, who at the time was a mate of a whaling vessel. G. C. B.]

## SECTION SIXTH.

### THE LYMPHATIC SYSTEM.

The operations required by the lymphatic system are applicable only to the ganglionic (i. e., glandular) portion of this part of the organization. But as on the other hand the diseases of the lymphatic glands which occasionally call for surgical aid, almost all of them present themselves under the form of tumors, I shall have an opportunity of speaking of them while treating of this last mentioned class of affections.

[M. Demarquay has published in the *Mem. de la Soc. de Chir. de Paris*, tom. III. fas. 2. the particulars of two cases of lymphorrhagia. As these cases are very uncommon, we copy from the *Ass: Md. Journ.* Feb. 1853, the details of one of these cases, with the accompanying remarks :

CASE 2.—This case was observed by Dr. Fitzer. A young lady, æt. 16, who had not menstruated, and had had crural hernia from the age of eight years. In 1847, she found that she had on her abdomen a number of small granular elevations; she was examined by Dr. Fitzer, who found a brownish stripe, three finger-breadths in width, commencing an inch below the umbilicus, to the left of the linea alba. It extended to the left and upwards, passing between the false ribs and the ilium, and ended at the dorsal vertebræ, becoming smaller and more transparent at this part. The middle part of this streak was prominent, and was formed of about eighteen papillary enlargements; some of these resembled the mamillary papillæ in men, others those in women; they were not tender to the touch, and disappeared on pressure. In July, the patient felt some pain in the situation of the streak; and on the 31st of that month, after returning from a walk, she found that there was escaping a milky coagulable fluid. She estimated the quantity which escaped at a quarter of a pint. Dr. Fitzer found the appearance of the parts the same as before. The fluid continued to escape during three days. It was milky, of a saline taste, alkaline, and escaped from two of the largest of the elevations which have been described. When one orifice was compressed, more lymph flowed from the other. Dr. Fitzer cut one of the elevations with curved scissors;



he was able to pass a probe for an inch right and left; a quantity of lymph escaped from this incision. Pressure, and the application of alum were insufficient to restrain the flow of lymph; Dr. Fitzer therefore applied nitrate of silver. It was important to arrest the disease, as the girl was losing strength, and the pulse was becoming weak. The lymphorrhagia ceased, but the granular projections remained: new ones were even formed, of the size of a lentil or millet-seed, while the skin over the remaining part of the streak had become pale, like that of the rest of the abdomen.

Microscopical and chemical analysis of the fluid, made by M. Schlossberger, left no doubt that it was lymph.

M. Demarquay has not been able, after diligent search, to find any records of cases of lymphorrhagia from spontaneous rupture of the vessels; cases of lymphorrhagia from wounds have been recorded by Nuek, Van Swieten, and Assalini.

Dilatation of the lymphatic vessels has been observed by Baillie, Maseagni, Amussat, Bresehet, Sir A. Cooper, Biehat, Sommering, Morgagni, Beau, Ricord; also, by Bidloo, Meekel, Rokitansky, Albers, Andral, Otto, and Hasse. (*Hasse's Pathological Anatomy*, "*Sydenham Society's Translation*," p. 9.) But the facts have not as yet been sufficient to enable pathologists to determine the causes, forms, varieties, diagnosis, prognosis, or treatment of the disease. As far as M. Demarquay knows, M. Beau is the only surgeon who has attended to the treatment. In cases of dilatation of the lymphatics of the prepuce, he introduces a small seton into the dilated vessel, and removes it at the end of three or four hours. Obliteration is thus produced. G. C. B.]

## SECTION SEVENTH.

### THE NERVOUS SYSTEM.

Although most authors upon operative surgery have neglected to treat of the nerves, they are nevertheless liable to a number of diseases which often require its interposition.

Among the affections of the nervous system, there are two especially which I cannot omit to treat of in this point of view; These are the neuromas, and the different kinds of neuralgia. The nature of neuromas and tumors of the nerves being still a subject of dispute with pathologists, induces me to consign them also to the class of tumors. I shall consequently at present treat only of operations which are admissible for neuralgia, in other words of the section and excision of nerves.

It was natural to suppose, that in destroying the continuity of the sensitive nerves, we should thus prevent the transmission of the pain to the brain, and succeed in curing the neuralgia. As the nerves on the other hand have no retractility, it was apprehended that after being divided they might reunite anew, and that their mere division would not be followed by any permanent relief. Experience unfortunately has too well confirmed these anticipations. It was on that account that the idea suggested itself of destroying a sufficient portion of the nerve to render its reunion impossible. Caustics and the hot iron recommend-



ed to carry out this recommendation have the serious inconvenience of making too large a cicatrix and horribly disfiguring the patient. In our times the cutting instrument has generally been substituted for them. By means of an incision in the track of the wrinkles of the skin, the muscular fibres or the principal vessels, we are enabled to lay the nerves bare at their exit from the bone, to divide them before they have given off any branch, and to remove a portion of them of the length of some lines. The wound cicatrizing by the first intention, the scar, after the cure, is lost in the folds of the skin, and the continuity of the nerve being effectually destroyed, it seems impossible that the neuralgia should not be arrested.

It is far from being true, however, that clinical observations on this point have never contradicted the theory. Often, and too often, the disease does not yield either to excision or incision performed in the very best manner, and there are numbers of persons who have been no more benefited by one of these operations than by the other, no more than they have been by deepest cauterizations. There was at the Hospital of St. Antoine, in 1829, a man of about 45 years of age, who, for the space of fifteen years, had been affected by a tic douloureux, and who had undergone successively the section and excision of all the nerves of the face, but without experiencing any relief whatever. As, however, more fortunate results have been stated, we may, when we have unavailingly made trial of all other modes of treatment, and the sufferings of the patient are exceedingly acute, suggest to him the excision of the nerves as a last resource, which it would be uncharitable, perhaps, to deprive him of in certain cases of obstinate neuralgia.

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## CHAPTER I.

### NERVES OF THE HEAD AND NECK.

So common are neuralgias of the head, and so excruciating is their pain, that it has often been proposed, when all our resources of hygiene and pharmacy have failed, to have recourse to cauterization, or the section or excision of the nerves supposed to be affected. There are, moreover a great number of the head which it might be advantageous to subject to this treatment. The chief of these, besides the branches from the cranium, are the frontal, infra-orbital, inferior dental, the facial and some branches of superior dental.

#### ARTICLE I.—NERVES OF THE CRANIUM.

Many authors have mentioned neuralgias established in the head as a consequence of wounds, and which have yielded only to incision or excision. A young girl, for a long time subject to convulsions, epilepsy, and neuralgia of every variety, was instantly cured by an incision which Pouteau (*Œuvres Posthumes*, t. II., p. 83, 86, 92,) made above the

mastoid process, the part upon which the patient had received a blow a long time before. In another patient, Pouteau had recourse, in the same way, to three incisions upon different points of the cranium, and was not less successful than in the preceding case. The same author succeeded with a similar operation performed upon the cranium of a young man, aged 24 years, who had fallen upon his head sixteen years before. In these three cases, Pouteau confined himself, it is true, to incision, but he tamponed the wound, and did not unite by the first intention.

## ARTICLE II.—NERVES OF THE FACE.

The face is the part upon which the section or excision of the nerves is most frequently performed. It is probably also the region where the operation is least apt to succeed.

### § I.—*The Frontal Nerve.*

When we wish to derive all the advantage possible from the excision of the supra-orbital nerve, we should seize it at the moment when, as it emerges from the supra-orbital notch, it is reflected backward close to the bone, and before the outer and inner anastomosing branches are given off from it, for the purpose of inoculating with the surrounding nerves. In that part it is covered only by the skin, a thin lamellar tissue of cellular substance, and some pale fibres of the orbicularis palpebrarum muscle. The artery which runs by the side of it is not of sufficient size to create any apprehension of wounding it, and in the neighborhood there are no other organs that the instrument can encounter. Should we not be enabled to identify the nerve at first, all that will be required to determine its position will be, to recollect that the groove or hole which gives passage to it, is situated at the union of the inner third with the outer two-thirds of the upper orbital arch, that is to say, at about an inch outside of the root of the nose, and that by following the border of the orbit with the point of the finger, from the nasal process to the temporal process of the frontal bone, we have it almost constantly in our power to ascertain its exact locality.

A. The operator, placed behind the patient, raises the eye-brow with his left hand, and while an assistant depresses the lids, he again makes himself sure of the position occupied by the diseased nerve, seizes a straight bistoury with the other hand, and holding it as a writing-pen, directs the point upon the internal orbital process, draws the instrument upwards, then outwardly, and divides all the tissues down to the bone to the extent of an inch, a little above, and in the direction of the adherent border of the eyelid; he then gently separates the edges of this semi-lunar wound; finishes the section of the nerve if it is not completed; hooks up the anterior portion with a good pair of dissecting forceps; isolates it, and excises a sufficient extent of it to prevent the possibility afterwards of a reunion of the two extremities.

Nothing now remains in the way to prevent our proceeding at once to reunion of the integuments by first intention. The loss of substance which the nerve has undergone, gives us, so far as that is concerned,

every security on this head. As, however, the least infiltration of extraneous fluid into tissues so flexible and so easy to become disunited, as are those of the eyelid and orbit, might lead to purulent collections and dangerous inflammations, it appears to me more prudent that the wound should be left to suppurate. We are to dress it then loosely with a plumasseau besmeared with eerate, or, if there be hemorrhage, we use the perforated linen and balls of lint, and that for the first dressing only. It afterwards requires no other attention than ordinary simple wounds, and cicatrization is soon accomplished.

B. In a patient who suffered horrible pain in the orbit, from a wound of a lance in the forehead, M. Larrey (*Clin. Chir.*, t. I., ou Descot, *Op. cit.*) destroyed every symptom of tetanus by a division of the frontal nerve; and the same operation has succeeded, in one out of two cases, with M. Warren. Hennen and M. Guthrie, (*Archiv. Gén.*, t. XXV., p. 94; et Mackenzie, *Maladies des Yeux*,) who, following the recommendation of Beer, confine themselves to the simple section, have not succeeded; while, by uniting cauterization with it, M. Ribéri (Bellinghieri, *Arch. Gén. de Méd.*, 2e série, t. VII., p. 209) was enabled to cure his patient.

## § II.—*Infra Orbital Nerve.*

This nerve being more deep-seated, surrounded with important parts, and spreading out like a fan upon its exit from the bones, is much less easy of excision than the preceding; it is also much less subject to neuralgia. Two modes may be followed to effect the object.

A. *By the Mouth.*—In prolonging upwards for the space of an inch the groove which unites the lip to the jaw, we traverse all the upper part of the canine fossa, and reach the root of the nerve, which is found in the direction of the first molar tooth, at the distance of three or four lines below the orbit. The bistoury, which should be used at first, should now, for the last stage of the operation, be replaced by the straight seissors. The principal advantage of this method, which was practised by M. Richerand, and who went to the extent of scraping the bone with his instrument, is that of leaving no mark on the face; but it has the disadvantage of allowing only of a simple section of the nerve, when in fact it would be desirable to excise it.

B. *By the Face*, the instrument divides, from the skin to the bones, all the soft parts which compose the cheek; and it is this, undeniably, which makes it more objectionable, at least among persons of the female sex. Fortunately, however, by following the natural furrows of the face, in the place of adhering exclusively, as M. Langenbeck (*Biblioth. de Chirurgie, ou Nosologie und Therap.*) advises, to the direction of the fleshy fibres, it is in our power to obtain a cicatrix which will scarcely be observable.

I. *Operative Process.*—The patient should be seated, and arranged, and supported as for all other operations performed upon the face. Armed with a straight bistoury and placed in front, the surgeon makes at the bottom of the *naso-jugal* furrow, that is, from the groove or a line which extends obliquely from the ala of the nose to the middle of the space which separates the prominence of the cheek from the cor-



responding labial angle; he makes, I say, in this direction, an incision an inch and a half in length, commencing at the outer side of the ascending process of the maxillary bone; he divides at first the skin only, and soon after meets the facial vein, which he pushes aside outwardly; he then comes to fatty tissue; then to the levator labii superioris, which he pushes backwards and inwards; then the levator anguli oris, under the inner border of which the nerve often lies concealed, now makes its appearance. To enable the operator to separate all these different parts, he must use a steel grooved sound, without any cul-de-sac. Detaching the filaments or tissues which still conceal or may conceal the nerve affected, he finally divides it very near the infra-orbital foramen, and excises a portion of it, which finishes the operation.

II. M. Warren, who has performed this operation twice, succeeded but in one case. M. A. Bérard, (Godin, *Journal des Conn. Méd.-Chir.*, t. III., p. 442,) who thought the T incision preferable, did not, however, succeed with it in the case of neuralgia in which he employed it; while M. André, (Hamel, *Thèses*, in 8vo, t. XXV.,) for a case of old infra-orbital neuralgia in a lady who fell under his care, was obliged to resort to deep cauterization.

### § III.—*Superior Dental Nerve.*

Being derived from the second branch of the fifth pair, the nerves of the upper dental arcade forbid the division of their trunk, when they become the seat of neuralgic pain; but it is sometimes practicable to attack them at the source of the disease. M. C., from the neighborhood of Cusset, was recommended to me in 1835, by M. Giraudet, now a practitioner at Tours. For fifteen years this patient had suffered from pains in the right side of his face, which nothing could assuage. These pains commenced in the spot which is usually occupied by the last molar tooth. In passing my finger on this region, I thought I perceived a slight granulation, which, when touched, immediately caused a violent access of suffering. There existed a possibility of obtaining relief by excising the region thus touched. By means of a pair of long, cutting nippers, curved suddenly and nearly at right angles on the borders near their cutting extremity, I embraced the whole posterior extremity of the margin of the jaw, and removed it at a single stroke. The pains were soon assuaged, and a year afterwards I received from M. Giraudet a letter, announcing the entire cure of our patient.

### § IV.—*Inferior Dental Nerve.*

The inferior maxillary nerve emerges from the jaw by the foramen mentale under the bony groove which separates the alveolar processes from the canine tooth and the first molar.

A. *Process of the Author.*—Nothing is more easy than to reach it at this point. While with one hand the surgeon reverses the lip outward and backward, he incises by means of a straight bistoury in the other, layer after layer and from above downwards, the tissues which are found at the bottom of the maxillo-labial groove. The teeth



just mentioned will be his guide. In a short time, that is, at some lines in depth, he encounters the nerve, and isolates it to the extent of a quarter of an inch, by removing from the jaw the posterior portion of the soft parts which cover it, and then excises it in the same manner as has been said of the frontal nerve, and makes use of no dressing afterwards.

B. The *bleeding* however is quite troublesome by this process, for which reason M. Bérard (*Godin, Jour. des Conn. Méd. Chir.*, t. III., p. 442) preferred making a T incision reversed, laying open the whole depth of the tissues on the side of the chin; it appears, also, that the patient operated upon by this surgeon was perfectly cured. To apply the red-hot iron to the skin opposite the mental foramen, as Museux (*Bull. de la Fac. de Méd.*, t. I.) declares he has done with success, or immediately to destroy the nerve with caustic potash, as André (*Hamel, Oper. cit.*) did successfully in a man upon whom Maréchal had unavailingly performed the section of the dental nerve, would neither be as simple nor as certain as this kind of excision.

C. When the neuralgia is seated at a greater depth, M. Warren (*Journal des Progres*, t. XII., p. 270) has no apprehension of attacking the trunk of the maxillary nerve itself, and excising a portion of it in front of the pterygoid muscles. A crucial excision of the skin, the parotid gland, and masseter muscle, enabled him to apply the crown of a trephine upon the coronoid process, and by means of a probe to raise up the nerve above the dental canal, and excise about three lines of it with the scissors. The accompanying artery was wounded and tied without difficulty. The patient, who had been only temporarily relieved, but not cured by other excisions, and who suffered excessive pains, ceased to be troubled immediately after the operation, and has continued ever since in excellent health.

On the dead body this operation is not very difficult. In making trial of it, I have found it would be better to incise the parts in a semicircular and oblique direction from the lobule of the ear to the border of the jaw and front of the masseter, which latter it would be advisable to divide, and to raise up its fibres from behind forward; the trephine, applied upon the base of the coronoid process on a line with the sigmoid notch, falls exactly upon the nerve, and may even be made to divide it with the same stroke.

D. If the neuralgia were seated in a single tooth, we might, after the plan of M. Fattori, (*Rév. Méd.*, 1825, t. I., p. 294,) trephine the side of the alveolar process, and thus destroy the filament of nerve which is implicated. But the excision of the part in such cases is at the same time more certain and more expeditious.

[In the Appendix to the last edition, M. Velpeau inserted the following extract from a letter addressed to him by M. Hysern, of Madrid:

"In June, 1834, I operated on D. J. Bonavida, æt. 54, attacked 11 years before with a severe neuralgia on the right side of the face, and for which other surgeons had in vain performed the section of the inferior dental nerve, the extirpation of some lines of this nerve, its cauterization in the foramen mentale, and the section of the facial nerve; I effected the extirpation of the nerve in the whole length of the dental groove of the lower jaw. To effect this, I raised almost the whole ex-

ternal table of the bone, in insulating it by four cuts of the saw, aided by the gouge and mallet. I afterwards took hold of the nerve with the dissecting forceps, and extirpated it completely, after which I cauterized the superior extremity of it with red hot-iron. Having remarked that the pains affected not only the dental trunk, but also the most superficial parts of the lower half of the cheek, and the corresponding half of the lower lip, and of the chin down to the base of the jaw, where were distributed the filaments of the nerve formerly extirpated by Professor Argumosa, I took away also all these soft parts, and I finished the operation by autoplasty, according to my method, by means of the skin of the neck and of the platysma myoides.

"There was at first considerable relief, and the patient felt no other than slight pains produced by atmospheric changes. This state lasted for nearly six months; the pains returned then with the same intensity as before, but in the direction of the infra-orbital plexus, the buccal nerves, the lingual, and, as it seemed to me, of the portion of the inferior dental trunk which remained behind the jaw.

"The patient immediately demanded another operation. I resisted for some time, seeing the return of the disease; but at length, perceiving no other means of relief, I yielded. I undertook and effected the extirpation of the infra-orbital plexus and the buccal nerve, from the internal face of the masseter muscle to an inch and a half in front, then that of the inferior dental and lingual nerves, at three to four lines below the foramen ovale of the sphenoid bone; so that I took away more than an inch of the dental nerve, and twenty lines of the lingual.

"Having commenced by incising freely, and almost horizontally, the cheek, from the commissure of the lips to a little beyond the anterior border of the masseter muscle, and without interfering with that, I dissected out the buccal and the inferior dental and lingual nerves, between the pterygoid muscle and the ramus of the jaw; then I took hold of them with the blunt hooks, (*érignes mousses*.) I assured myself, and more than twenty persons present, most of them distinguished surgeons, also satisfied themselves, that it was truly the nerves described that I held in the *érignes*. I then passed a blunt-pointed very narrow bistoury to their upper part, and turned the edge of it against the nerves. In drawing, at the same time, the *érignes* with the other hand, I was enabled to make their upper section, avoiding thus the internal maxillary artery and every other vessel; I avoided, also, the internal lateral ligament of the lower jaw, and I finished by cutting the nerves at the lower part with the scissors."

M. Sedillot, of Strasburgh, has, recently performed the following operation on the dental branch of the inferior maxillary nerve, for the relief of an obstinate neuralgic affection:—

An incision was made along the inferior border of the lower maxilla from the canine tooth to the anterior border of the masseter. The soft parts were then divided to the bone, and a flap raised towards the upper part of the face, from over the dental foramen, whence the dental branch was seen emerging in thick and voluminous ramifications. A small trephine was then applied one inch posteriorly to this foramen, and a circular piece of bone, about two lines thick, removed. By breaking up a few lamellæ of bone the dental nerve was laid bare, and

cut at the posterior edge of the osseous aperture. Another section of the same nerve was then made two-thirds of an inch anterior to the dental foramen, and the operator then seized with two forceps the anterior and posterior extremities of the piece of nerve lying between the locality of the two sections. By pulling it backwards and forwards, its cellular connections were weakened, and the portion of nerve then extracted altogether by its anterior extremity. This isolated piece of nerve was about one inch and a quarter long, round, of an opaline color, and presented no striking vascularity. The flap was allowed to fall down again, and the report mentions that the patient said on the eighth day that she suffered no more pain, and on the sixteenth the wound was quite healed, the cicatrix being hardly visible.

Dr. J. M. Warren reported to the *Boston Society of Medical Improvement*, a case of *Tic Douloureux* which was relieved by the removal of a portion of the inferior maxillary nerve, after trephining the lower jaw bone. A notice of this operation may be found in the *American Journal of Medical Sciences*, April, 1850, p. 369.

In May, 1854, we witnessed an operation of this kind, performed by Professor Parker. The patient, a female, who resided in Brooklyn, had for 20 years suffered the most excruciating pain, which attacked her even during sleep, and rendered life almost insupportable. In this instance, the proceeding has been followed by the most gratifying results, and as we were informed by Prof. P. in September, 1854, she remained free from the tortures which she had so long endured. G. C. B.]

### § V. *Facial Nerve.*

The portio dura of the seventh pair, spreading out as it does, upon almost every point of the visage, would naturally, at first sight, be supposed to be more frequently the seat of facial neuralgia than the other nerves, and consequently it is the one which has been often frequently excised.

A. Its *temporal-facial* branch, the only one which surgery has ventured to attack, crosses the neck of the condyle of the jaw at the point where the lobe of ear unites to the integuments of the face. It is in this place that we should lay it bare. An incision, slightly oblique, is made from before backwards or almost vertical, which commences at the zygomatic process, and terminates on the posterior border of the jaw above its angle. We have to divide successively the cellulo-adipose tissue, an aponeurotic layer and some slight prolongations of the parotid gland, before finding the nerve, which is separated from the bone only by lamellar and filamentous cellular tissue. By this method we are sure to avoid the temporal artery; and should the transverse facial artery be wounded, its compression would be too easy to make the hemorrhage from it cause any disquietude.

B. The other, the *cervico-facial* branch, being lost, as it were, in the parotid, presents too many anomalies in its position, while the trunk itself of the facial has been considered too deep-seated, and surrounded with parts too important to think of excising these nerves. We may, as I think, without rashness, appeal from this decision.



C. I have often ascertained on the dead body that the *trunk* of the facial nerve could be laid bare without danger at its exit from the cranium and before it has furnished other branches than the filaments of the mastoid, digastric, and stylo-hyoid. For that purpose, the operator has only to make a vertical incision an inch and a half long between the mastoid process and the lobe of the ear; then in coming down to the anterior face of the osseous projection and the corresponding edge of the sterno-mastoid muscle, a depth of 6 to 10 lines, he has to divide, layer by layer, the teguments, the cellular tissue, and the parotid gland, which latter is to be turned forward. The lips being drawn apart, we perceive the nerve at the bottom of the wound, nearly in the middle of the space which separates the temporo-maxillary articulation from the apex of the mastoid process, and where it seems to take a direction towards the border of the inferior maxillary bone. The division and even the excision of it is then in every respect as simple and easy as that of the frontal, and it is clear that his section, in itself, presents all the security desirable under such circumstances, if it be true also that these different excisions of the nerves are, in fact, the actual remedy for facial neuralgia. I purposely suggest some doubts as to these excisions, because the facts yet ascertained are not sufficiently conclusive in their favor. If, in some cases, they have been followed by a marked diminution, or even the entire subsidence of the pains, we have much more frequently observed that they procured no relief, or assuaged the anguish but momentarily. I have mentioned the case of a man who was subjected to all these operations on both sides of the face, and without experiencing any appreciable advantage from them. M. Warren had a patient, in whom, after the excision successively, of the frontal, infra-orbital, and facial nerve, only temporary relief was obtained. Boyer communicated to me a similar observation. The patient in whom he excised successively the four principal nerves of the face, though at first slightly relieved, was no more cured than the one of whom I have spoken. Moreover, if it be true that the frontal, infra-orbital and mental nerves, in fact, that all the branches of the fifth pair are exclusively nerves of sensation, while the seventh pair is alone charged with the office of presiding over the muscular movements of the face, then is it evident that the section of this last can have no other effect than to paralyze the muscles of the face, while to the other three only, must our attention be directed in whatever concerns neuralgia.

[M. Hilton, of Guy's Hospital, has divided the Gustatory nerve, with a view of blunting the sensation of the part in a case of cancer of the tongue. The tongue, having been drawn out, and steadied by an assistant, Mr. H. divided vertically, with a small knife, the mucous membrane, and sub-mucous tissue, for about three quarters of an inch, over the hyoglossus muscle, and above the sublingual gland. The incision was continued through the upper edge of the sub-lingual gland, and the nerve exposed. The flow of venous blood greatly obscured the parts. On dividing the nerve with seissors, all sensation was immediately lost in the anterior part of the tongue, on the left side, as well as in the ulcer. One month afterwards, the patient regained slight feeling at the tip of the tongue, and the ulcer became somewhat painful to the touch, and the disease extending, destroyed



the patient about four months after her discharge from the hospital. The division of the nerve in this case obviated the suffering from the application of the ligatures which were employed to remove the diseased mass, and Mr. Hilton asserts that it never should be omitted when such a proceeding is about to be attempted, (*Lond. Lancet*, Am. Ed. June, 1851, p. 52. G. C. B.]

### ARTICLE III.—NERVES OF THE NECK.

Up to the present time I believe no one has undertaken the section or excision of the nerves of the neck. M. H. Bérard however has related to me the case of a woman who suffered so severely in the sterno-mastoid or carotid region, that she earnestly entreated that some operation might be performed which might relieve her of her distress; a small deep-seated tumor was perceptible which appeared to be situated upon the pneumogastric nerve. This woman, however, died I believe, without having had any thing done for her. Having also myself observed a nervous tumor in the same region, and which appeared to belong to the great sympathetic nerve, I shall, in treating of operations applicable to tumors, describe the process which is to be followed to enable us to reach down to these nerves. I may make the same remark in regard to what concerns the section of the nerves of the thorax.

[Mr. Fearn reported in the *Prov. Med. & Surg. Journal*, Sept, 8th, 1847, a case of wound of the internal carotid artery, and division of the par vagum, in which, after the ligature of the common carotid, the patient lived upwards of eleven weeks from the receipt of the injury. She suffered from difficulty of swallowing, and cough, which continued to increase until she died. G. C. B.]

[*Division of the Par Vagum on one side without causing death, and followed by recovery.*—I understand that very recently and within a few months, Dr. McClellan, an eminent surgeon of Philadelphia, in removing an enlarged parotid gland from below the angle of the jaw, and which had extended to some distance down into the neck, was obliged, from the par vagum on that side being embedded in the tumor, to exsect and actually *take away about two inches of this important nerve* without producing apparently much inconvenience to the respiratory or other functions. Finding such an unprecedented result from the exsection of so important a nerve, which, as far as we are informed, had never before been interfered with on the human subject, but on the contrary always avoided with extreme caution; the surgeon designedly left the wound open for some days, in order that other surgeons of Philadelphia might satisfy themselves, by inspecting it, of the truth of what had occurred. The fact is thus placed beyond dispute, that all the vital functions of this important pair of nerves may, in living man, be performed by *one nerve alone*, which could have scarcely been anticipated from the pathological and physiological views hitherto entertained.

Nevertheless, Dr. Mott has always scrupulously avoided wounding or dividing this nerve in all his surgical operations; and is satisfied that such ought to be the rule in every case where it is possible so to do, notwithstanding the pathological fact established by Dr. McClellan. In this case of Dr. McClellan, he thinks the functions of the nerve, on the

diseased side, may have been interrupted, or to a certain extent annihilated, before the operation was performed. Its situation in the tumor in which it was imprisoned and compressed, warrants this inference. T.]

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## CHAPTER II.

### NERVES OF THE LIMBS.

#### ARTICLE I.—NERVES OF THE THORACIC EXTREMITIES.

##### § I.—*The Fore-arm.*

We may have occasion in the arm to make the division of the radial, ulnar, or cutaneous nerves, and even that of the median nerve.

[Exsection of the median nerve was first performed in America by Dr. Mott. Dr Darling proposes the following mode of reaching this nerve.

“An incision, from an inch and a half to two inches in length should be made along the ulnar border of the tendon of the palmaris longus muscle, a little above its insertion into the annular ligament. The integument, superficial fascia, and aponeurosis of the fore-arm being successively divided, the median nerve will be brought into view, situated behind, and rather towards the ulnar border of the tendon, where it may be readily distinguished from the tendons of the flexor sublinis by its whiteness, or by pinching it with a forceps, when great pain will be experienced in the thumb, the index, and middle fingers. If the hand be now slightly flexed on the fore-arm, the palmaris longus may be pushed to the radial side, and a portion of the nerve be easily exsected. It is perhaps unnecessary to add, that the upper section must be made first.

In cases where the palmaris longus is wanting, the nerve can readily be exposed by making the incision three-eighths of an inch from the ulnar side of the tendon of the flexor carpi radialis.” This is certainly far preferable to, and much safer than dividing the trunk of this nerve, high up in the arm, upon the inner side of the biceps flexor cubiti muscle. T.]

[Some two inches of the median nerve removed by Prof. Parker of this city, during the extirpation of an encephaloid tumor from the arm, with which the nerve was inseparably connected. The paralysis resulting from this occurrence, in a few weeks began to disappear, and at length the use of the arm was perfectly regained. The exsected portion of the nerve had doubtless been regenerated, the possibility of which has been proved by the observation of Cruikshank, Haighton, Fontana, Monro, Michaelis, Meyer, Tiedemann Prevost and Swan. True, the restoration of the functions of a paralysed limb has been otherwise explained by Reil, Sæmmering, Breschet and Jobert. According to their views of the subject, this change is to be attributed to the influence of anastomosing branches, rather than to a direct union of the main trunk of the divided nerve, but Meyer succeeded in tracing the uniting medium, by subject-

ing the intermediate cicatrix to the action of nitric acid, and proved that this medium was composed of the nervous filament itself.

In some instances however after the division of a nerve, it seems doubtful if union takes place in the manner above mentioned. An interesting case is related by Mr. Fergusson (Pract. Surgery, 3rd Lond. Ed., p. 287.) in which he assisted Dr. Simpson of Edinburgh in an attempt, by an operation, to re-establish the continuity in a divided median nerve. In this instance, a small tumor had formed on the upper extremity of the cut nerve, such as is seen occasionally after amputation, and its removal required the exsection of about one inch of the median nerve. The divided ends were brought as nearly as possible into contact, but some years elapsed before any material increase occurred in the temperature and sensibility of those parts supplied by this nerve. On the same page he relates another case, in which he divided the median nerve, for the relief of the pain produced by a tumor, about the size of a hazel nut, in the palm of the hand, and which was supposed to be a growth in the substance of one of the branches of the median nerve. The simple division, in this case, did not effect the desired object. G. C. B.]

A. *Ulnar nerve.* In 1832 Lauth wrote me that he had practised the excision of the ulnar nerve three times in epileptic patients; the operation succeeded in one of the cases, but failed in two others. The paroxysms in the first case were ushered in by an *aura epileptica*, while in the others this did not occur. If we wish to repeat this operation, whatever may be the indication, the limb should be placed in the same position as for tying the arteries. The parts would be incised in the same place and in the same manner as for this last operation. After having divided the integuments and a first aponeurotic layer, then pushed to the inner side the flexor carpi ulnaris, and divided a second fibrous layer, we should find the nerve in the form of a white cord within and a little behind the artery. After having isolated and raised it, we should excise from it a fragment of at least from two to four lines in length. If we should limit ourselves to dividing it transversely, its two ends would soon reunite, and there would be nothing to hope from the operation. In a case thus treated by M. Cairoli, (*Arch. Gén. de Méd.*, 2 sér., p. 137,) Professor Viviani saw the neuralgia reappear at the expiration of a few days. In the case of a gardener, noticed by A. Dubois, (*Descot, Affections Locales des Nerfs*, 1825,) and who had the ulnar nerve above the wrist divided by the cut of a pruning knife, the paralysis lasted but a very short time. Excision more formidable than the division as respects the paralysis which it should seem it ought to produce in the third or fourth fingers, has not, however, been always followed by it. A young man had in this manner a portion of his ulnar nerve and the corresponding artery destroyed above the wrist by an accident. A paralysis which continued for six weeks in the two fingers, mentioned, afterwards gradually disappeared. When I saw the young man again, a year after, he felt nothing more of it.

[Mr. Fergusson (*op. cit.* p. 288) remarks: "In an instance of painful ulcer on the arm, a little above the inner condyle, I have seen a portion of the ulnar nerve, supposed to be involved in the sore, removed with excellent effect. The painful open surface which has been present for many months, and resisted all attempts at cure, speedily put



on a more healthy aspect, and the operation, although it deprived the little finger and the ulnar side of the ring one of sensibility, was attended with all the benefit that could have been desired. G. C. B.]

B. *Radial nerve.* Among the examples of the section of the radial nerve, there is one related by M. A. Cooper, (*Arch. Gén. de Méd.*, 1838, t. II., p. 183,) in which the operation was performed for a neuralgia caused by a contusion of the thumb, and attended with success. A similar fact is related by M. Wilson, (Swan, *Maladies des Nerfs*, p. 117.) M. Teewan, another English surgeon, (*Arch. Gén. de Méd.*, loc. cit.,) has been equally successful in ordinary cases of neuralgia. But it was a cutaneous nerve and not the radial which M. Wilson divided.

The operation in such cases exacts precisely the same precautions as in the ligature upon the radial artery. Except that the incision should be made outside of the track of the artery, since the nerve is found nearly in the middle of the space which separates the outer edge of the radius from the course of the vessel.

As the radial nerve is of infinitely less importance than the ulnar, we might without any apprehension, excise a long portion of it. In a young lady who was exhausted by the pain, A. Petit (Verpinet, *Journal de Méd.*, t. X.; Descot, p. 18) effected a complete cure in his patient by producing a large eschar by means of the hot iron applied upon a cicatrix which included the radial nerve.

## § II.—The Elbow.

The nerves which lie in the neighborhood of the veins in the bend of the arm, have been so frequently charged with causing severe accidents resulting from bleeding, that early attention was directed to the subject of their division. It is an operation, however, which has not been subjected to any surgical rule, and one which was no longer thought of until M. Hamilton (*Arch. Gén. de Méd.*, 1838, t. II., p. 174) again drew public attention to it in 1837.

A. *The Cutaneous Nerves.*—The section of the cutaneous nerves has been performed by M. Watson, M. Sherwin, and also by M. Wilson to remedy accidents from bleeding. M. Crampton, however, in dividing for this purpose the cutaneous nerve in a young lady obtained only an imperfect cure.

1. Upon the supposition that we were not disposed to operate upon the point whence the pain originated, we might find the external cutaneous or musculo-cutaneous nerve above the fold of the arm between the biceps and the anterior border of the supinator radii longus. An incision, two inches in length, slightly oblique from above downwards, and from behind forwards, would, after having divided the skin, subcutaneous fascia, and aponeurosis, necessarily conduct to this nerve, after reaching which we should excise a portion of sufficient length.

II. For the internal cutaneous nerve, the incision would require a little more caution on account of the neighborhood of the artery. Carried obliquely from the middle of the lower part of the biceps to an inch below the internal condyle of the humerus, it should not go below the aponeurosis, since the internal cutaneous nerve is invariably situated

at this point in the thickness of the sub-cutaneous layer near the median, ulnar and basilic veins. [See a note of Dr. Mott on wounds of the cutaneous nerves in bleeding and the operation, Vol. I.]

III. *The Ulnar Nerve*.—Many of the nerves of the arm have long been submitted to the operation of excision; the ulnar alone, however, as it appears to me, has had this operation performed upon it at a prescribed point of its track. The operation was performed by Delpech (*Révue Méd.*, 1832, t. I., p. 80) in a lady who for a long time had suffered from a neuralgia which appeared to proceed from an ulcerous affection of the wrist. Holding the arm in such a manner as to turn the elbow forward, Delpech made an incision an inch and a half in length, between the olecranon and the inner condyle, over the immediate track of the ulnar nerve. This nerve was soon exposed to view, then divided on its upper part, and a portion excised. The pains immediately subsided, and ultimately disappeared. The complete paralysis which at first took place, became reduced to a slight numbness of the third and fourth fingers, which, however, retained all their mobility.

If the excision of the radial and the median has been performed upon the continuity of the arm, as M. Richius supposes, it has been in the case of tumors, of which I shall speak further on, and not for neuralgia. As it is the tumor which serves as the guide in such cases, I have not to discuss that subject in this place. The case related by M. Larrey belongs rather to the cutaneous nerves than to the radial.

## ARTICLE II.—THE NERVES OF THE LOWER EXTREMITY.

The excision of the *nerves of the foot*, unless they should be the seat of some nodosity or tumor, could not be subjected to any fixed rules as regards a surgical operation. The case is different, however, with the nerves of the leg or thigh.

### § I.—*Nerves of the Leg*.

There are four nerves of the leg which may be cut down to, and divided by the surgeon, viz.:—the internal saphena, the external saphena, the anterior tibial, and the posterior tibial.

A. *The Internal Saphena*.—If the internal saphena should be the seat of violent and obstinate pains, as in two patients in whom Sabatier was disposed to employ cauterization, nothing would be more easy than to excise a portion of it. We should do this on the point itself from whence the suffering appeared to proceed, as, for example, where a cicatrix or ancient lesion of the tissues was found on the leg. If not, we should seek for the nerve above the parts where the pains usually existed. We might reach the nerve by means of an incision an inch or two inches in length made upon the track of the vein of the same name. The nerve is almost constantly found upon the posterior face of this vessel. Nor would there be any serious inconvenience in excising with the same stroke the vein as well as the nerve, if the surgeon should meet with any difficulty in distinguishing the former. Only it would be necessary in that case to apply a ligature upon the lower end of the vein, if the wound was to be closed by first intention. It is unneces-

sary to add that this nerve, both on the foot and as high as above the knee, follows, as in the leg, the course of the vein.

B. *The External Saphena*.—In supposing that the suffering should be confined to the outer part of the foot, or the lower third of the leg, it would be practicable to excise the external saphena after the same rules which I have laid down for the internal saphena, that is, it would suffice to incise the integuments on the track of the vein bearing the same name, towards the fibular border of the foot behind the corresponding malleolus or outside of the tendo Achillis. Higher up we would not arrive at it with any certainty, except by making an oblique or transverse incision about two inches long on the outer and lower side of the calf. Cutting down to the aponeurosis, we should be enabled to recognize its trunk, the two roots of which unite a little higher up.

C. *Anterior Tibial Nerve*.—This nerve, supplying all the dorsal region of the foot, and traversing the whole anterior portion of the leg, may be attacked with neuralgia, or pains sufficiently acute to suggest the idea of dividing it or excising a portion of it. Nicod (*Journ. de Méd.*, Nov. 1818) says that the nervous accidents caused by this nerve becoming compressed between the fragments of bone in a fracture of the leg, caused the death of the patient. The operation, besides, being attended with a good deal of difficulty upon the instep and the whole anterior part of the leg, would not be entirely free from danger.

I would, therefore, recommend it to be performed below and behind the head of the fibula, where the nerve loses the name of the external popliteal. The limb, slightly flexed, should be turned upon its inner side. An incision, carried from the termination of the popliteal space to the beginning of the anterior inter-osseous fossa of the leg, so as to follow the groove which separates the tendon of the biceps muscle from the root of the gastrocnemius extensus, then to cross the external and anterior surface of the fibula immediately below the head of this bone, would perfectly fulfil our intention. To arrive at the nerve, the surgeon would thus have to divide successively the skin, sub-cutaneous fascia and aponeurosis; separating the tissues apart by means of a sound, he would then discover the nervous cord between the gastrocnemius extensus, which lies within and below, the tendon of the biceps, which is found above and outside with the head of the fibula, and the posterior border of this bone, or of the peroneus longus muscle which is seen in front. In case of difficulty, we might without danger cut down to the bone through the whole thickness of the peroneus itself, so that in searching from the head of the bone to eight or ten lines below, it would be impossible not to find the nerve. After raising it up on a grooved sound or an erigne, it should be excised in the same manner as we have said of others. Its excision at this point would have probably saved the patient of Nicod. Certain it is, that the patient operated upon in this manner by M. Yvan, (*Descot, Thèse No. 233, p. 43, Paris, 1822,*) was promptly and radically cured of an ancient neuralgia of the leg.

D. *Posterior Tibial Nerve*.—The excision of this nerve could not be performed without real danger, except between the termination of the calf and the beginning of the plantar surface of the foot; and it is behind the internal malleolus that the operation would be most practica-



ble, or the least dangerous. The leg is to be placed in demi-flexion on its outer side. The surgeon divides through the integuments, sub-cutaneous fascia, and aponeurosis, at about six lines behind the posterior border of the internal malleolus, and to the extent of two inches and parallel to the axis of the limb, in the same manner as for cutting down upon the posterior tibial artery. Situated behind and outside of this artery, and in the midst of a loose cellulo-adipose tissue, this nerve is recognized by its yellow color and its size and cord like appearance. The absence of pulsation, and the difficulty of compressing it, enables us, moreover, to distinguish it from the vessel. Having raised it upon a sound, or secured it with an erigne, we should excise a portion of it with strong scissors, in the manner already described.

[In the *Association Medical Journal*, January 6, 1854, p. 22, a case is referred to in which Mr. Patterson divided the posterior tibial nerve in tetanus after amputation and other means had been resorted to without avail. The original injury was inflicted on the toes. After the division of the posterior tibial nerve, it is stated, that the symptoms were immediately relieved, and the patient recovered. Mr. Murray has reported a case of tetanus in the *Transactions of the Med. and Phys. Soc. of Calcutta*, Vol. VI., p. 410, which he cured by dividing the posterior tibial nerve. The disease followed a punctured wound in the foot. Opposed to this case, is that which occurred in the practice of Professor Parker of this city. He excised a portion of the posterior tibial nerve for the purpose of relieving the excessive pain and tetanic symptoms arising from a punctured wound in the sole of the foot. The relief afforded was but temporary, and was rendered complete only by an amputation of the leg. G. C. B.]

In performing this operation, Delpech (*Lancetta Francaise*, t. V., p. 457—458; *Rev. Méd.*, 1832, t. I., p. 72) made his incision too near the edge of the bone; but the skill of the operator easily triumphed over this difficulty. It appears that the patient recovered perfectly. A fact to be noticed here is, that the foot, at first benumbed and almost insensible, finally regained to a great degree its faculty of motion and feeling. It results, therefore, from this, that the excision of the anterior tibial nerve would not probably cause a permanent paralysis of the extensor muscles of the toes, the loss of the movements of extension, and the establishment of a pes equinus, as was at first imagined.

As to the section of the saphena nerves, it could only interfere with the sensibility of the integuments, and this, it might be hoped, would not be of long duration.

## § II.—Nerves of the Thigh.

Among the nerves of the thigh, there are scarcely any other than the great sciatic whose excision could be attempted.

A. I have however read, in a volume recently published, that a surgeon, not content with having divided the sciatic nerve for a neuralgia of the leg, tried also to make the section of the femoral nerve; but it was found, after death, that he had missed it. To say that the division of the femoral nerve in the thigh ought not to be attempted, would be

entirely unnecessary, since, as all anatomists know, it divides itself into an infinity of branches, immediately upon its arrival at the groin.

B. As to the *sciatic nerve*, it is of so large a size, and it nourishes of itself so great an extent of parts, that the very idea of its excision, or even of its simple division, has in it something frightful. The sufferings from the sciatic have, on the other hand, a character so violent and of such obstinacy in certain patients, that one would be almost tempted to make trial of anything to put an end to them. We must, therefore, not be too much astonished to learn that the excision of this nerve has actually been performed, and that a surgeon of Italy has had the courage to recommend it.

It was in 1828, that M. Malagodi (*Arch. Gén. de Méd.*, 2e série, t. VI., p. 114) had recourse to this operation for the cure of a neuralgia which nothing had been able to relieve. The limb was placed as in the operation for a ligature upon the popliteal artery; the surgeon then made a long incision, from the middle third of the thigh to the hollow of the ham. Dividing through the integuments, sub-cutaneous fascia, and aponeurosis, he soon came between the biceps muscle, which is found upon the outside, and the semi-membranosus, which is situated upon the inner side. Continuing to divide the tissues layer by layer, and then substituting the end of the sound for the bistoury, he soon reached the nerve, in the form of a large cord of a slightly yellowish color.

The uppermost part of the region of the ham should be preferred in such cases: 1st. Because in this place the two branches of the sciatic, if it be that they have already separated, are still in close approximation to each other; 2d. Because the popliteal vein and artery, besides being always deeper and situated more within, are here much farther distant from the nerve than in the hollow of the ham itself.

After having properly isolated the sciatic nerve and passed his finger underneath, M. Malagodi performed the section of it in the upper angle of the wound. Numerous accidents ensued. The wound was five months cicatrizing; the limb, at first completely paralyzed, was a long time in recovering its sensibility; but it finally regained its functions, and the patient was, as we are told, perfectly cured at the expiration of a year.

I should not wish that this account would induce others to undertake such an operation, unless in a case of necessity; nor would I even assert that it could ever be indispensable; I would remark, only, that the case related by M. Malagodi ought to be registered and that the question merits the investigation of surgeons.

[According to Mr. Erichsen (*Science and Art of Surgery*, p. 565) our author has removed one of these tumors connected with the sciatic nerve, without dividing the latter itself.

Dr. Bayard, of St John's, N. B. removed the sciatic nerve involved in a tumor situated about three inches below the tuber ischii. It was of about the size of a goose's egg, producing great pain in the lumbar and sacral regions and the whole course of the leg. The emaciation was great, there were loss of appetite, colliquative perspirations, and restlessness. "After the bulk of the tumor was laid bare, and the nerve was exposed as it apparently entered into, and issued out of the swelling, the nerve itself was found to be very much thickened and enlarged;

it was, therefore, traced upwards as high as the tuber ischii and divided, and downward an inch below its popliteal ramification, and these removed. Syncope supervened, and the state of collapse continued for an hour, after which she gradually revived and complained of less pain than she had suffered for months past. The vital energies gradually sunk, and the woman expired on the sixth day, after the operation, apparently from extreme exhaustion. The fatal termination was supposed to arise from a continuation of the disease along the nerves within the pelvis, aggravated by the operation. (*New-York Med. & Phys. Journal*, Oct. 1829. p. 37, Communicated by Thomas Cock, M. D.)  
G. C. B.]

ARTICLE III.—EXCISION OF THE EXTREMITY OF THE NERVOUS TRUNKS AT THE BOTTOM OF ANCIENT WOUNDS OR CICATRICES.

We find, among those who have been amputated or wounded, patients who complain of exruciating pains when any one touches their scars, or the end of the stump. The observations of M. Larrey have shown that the nerves, after amputations, in becoming agglutinated together or adherent to the cicatrix itself, are liable to tumefaction and a peculiar change at their extremities. In these cases, the constancy of the pains and their circumscribed extent, and the manner in which they are propagated, induce us to suppose that the excision of the parts might be calculated, in some cases, to afford relief. It is an operation, however, which has hitherto never yet been attempted, and which it would be difficult, moreover, to arrange under any established rule of operative surgery. M. Champion, who was tempted to undertake it upon the sciatic nerve, for an obstinate neuralgia in the stump of a thigh which he had amputated, finally gave it up. M. Palmer (*Encyclograph. Méd.*, 1836, p. 41) had a case of convulsions and agonizing pains in the stump after amputation, but the excision of an inch of the fibular nerve, which protruded from the cicatrix in a state of hypertrophy, afforded but partial relief. I have no other instance at present to cite in favor of this operation.

*Electro-Puncture in Neuralgia.*—M. E. Hermel, (*Annales Medico-Psychologiques*, Paris, Janv., Mars & Mai, 1844.—*Journ. des Connaiss.*, Paris, Juillet, 1844, p. 27—8,) as an evidence of the successes which electro-puncture has had in his hands, in the treatment of some of the severest forms of neuralgia, almost all of them lumbo-sacral and sciatic, accompanied in some instances with partial paralysis, gives eight cases in which perfect cures were speedily effected by electro-puncture, when all the usual modes of depletion, purgation, &c., were of no avail.

He says nothing, however, of the still more formidable and distressing forms of neuralgia, known as *tic-douleureux*. Nevertheless, he is inspired with full confidence in the value of this remedy, and while he promises to supply fresh evidence thereof, meanwhile comes to these conclusions:—1, That electro-puncture is applicable to diopathic or essential neuralgias; 2, The violence of the pains is not a counter-indication to the employ of this therapeutic agent; they have never in any case been aggravated by its use; 3, The paralysis which supervenes



in the progress of idiopathic (essentiellles) neuralgias, yields to the same treatment.

*Inutility of Exsection for Neuralgia.*—M. Bérard, has seen (Malgaigne's *Manuel de Méd. Opérat.*, 4th edit., Paris, 1843, p. 150,) an *infra-orbital* neuralgia, return after having exsected *three inches* of the nerve, and Swan has seen the two ends of a nerve in a horse reunite, (Ib.,) after having exsected a segment near *nine inches* long!

M. Malgaigne suggests, (Ib.,) whether it might not be advisable after dividing the nerve to detach both ends by dissection, and fold them back on the trunk so as to form a noose, or to interpose between the ends a small fleshy flap from the immediate neighborhood, the better to interrupt, when the cicatrization is completed over this, the continuity of nervous influence.

M. Bonnet of Lyon, proposes in the frontal nerve to divide it freely down to the bone by a sub-cutaneous incision, (Ib., 151—152.)

M. Malgaigne, for the *infra-orbital* nerve, prefers also the sub-cutaneous section on the groove of the nerve in the floor of the orbit, after which he tears out the divided fragment from its groove by means of a forceps, applied to the portion of the nerve laid bare, and divided a little below the orbit, (Ib., p. 153.) M. Bonnet makes only a sub-cutaneous division of the nerve, (Ib.)

*Amputation of the Fingers and Arm, for Concussion of the Nerves of Sense.*—*Amputation* has been had recourse to, but without any benefit whatever, in cases for example, where the *little finger* from a mere blow, has without any external lesion been followed by severe neuralgic pain, and finally wasted away. Dr. Wigan, in a case of this kind in a lady who struck her little finger against a garden roller, amputated it, but finding the distress continue in two others, amputated them also, with a like unsuccessful result. Neuralgic pain in every part of the body came on, and the patient died a martyr. (Proceedings of the Medical Society of London, March, 1845.—*London Lancet*, May 3, 1845, p. 505.) Mr. Crisp proposes in such cases, (Ib., loc. cit.,) the possible advantage of removing a certain portion of the nerve, from the remarkable effect known from this kind of operation on the lame foot of horses.

According to Mr. Pilcher, (Ib., loc. cit.) the nerves of the organs of sense, as of the eye, may become paralytic by pure *concussion*, i. e., by a blow without any ecchymosis or change of structure. M. Dendy, however, (Ib., loc. cit.,) has known a family, the members of which were so delicate, that slight pressure on the surface produced a kind of thrombus. It is difficult to determine, however, how far neuralgic and paralytic diseases of the nerves are dependent on the influence of the nervous centres, or on local causes. Surgery in most such cases seems to have less resources than internal constitutional treatment, and external applications.

*Remarkable Ganglionic Transformation of the Nerves.*—M. Serres of Montpellier, communicated to the Academy of Sciences of Paris, April 3, 1843, (See *Journ. des Connaiss.*, &c., de Paris, Mai, 1843, p. 216,) the results of observations made by him upon a remarkable ganglionic transformation of the nerves of organic and animal life in two young men examined after death, one shown to him by M. Manec, at

Salpêtrière, in 1829, the other recently by Drs. Petit and Sappey. Both had died of typhoid (*entero-mesenterique*, improperly so called by French writers) fever. All the nerves of the limbs, and face, and the intercostals and lumbar nerves, were occupied in their course by numerous *ganglionic enlargements* (*renflemens ganglionnaires*) of the form and external physical characters of the superior cervical ganglion. The posterior branches of the spinal nerves were affected with this transformation to the same degree as the anterior branches; while the nervous branches of communication between these abnormal enlargements appeared to the naked eye to be unaffected. The number of these ganglions was less on the nervous filaments of the great sympathetic, than on those of the nerves of relation of life; but nevertheless, so considerable as to entirely change its aspect. The nerves that form the lumbar and sacral plexuses, the great sciatic nerves, and the two pneumo-gastric, were those upon which this transformation was the most extensively developed. For example, the *great sciatic nerves*, in their course through the upper part of the thighs, (*le long de la partie supérieure des cuisses*,) had acquired *the size of the humerus*, (*le volume de l'humerus*,) and their external surface was completely embossed by the inequality in the size of the abnormal enlargements.

In neither case did the structure of the cerebro-spinal axis, present any trace of alteration; which, says M. Serres, is another argument against the opinion of Gall that the spinal marrow of man and vertebrated animals is of a ganglionic structure. Dr. Petit adds that the groove on the inner border of the ribs, for the passage of the intercostal vessels and nerves, was increased in width and depth; produced doubtless by the ganglionic enlargement of the intercostal nerves, and which, as well as the inequality of development of these abnormal ganglions generally, seemed to show that the degeneration had been a long time in progression.

*Nervous Substitutions.*—At the sitting of the Academy of Sciences, of Paris, Jan. 6, 1845, (*Gaz. Méd. de Paris*, Janv. 11, 1845, p. 28,) Dr. Taignot, in a communication on the subject of “substitutions veineuses,” remarks that considering it now to be established by a great number of experiments, that when a nerve is divided, and its two cut extremities are placed in juxtaposition, it recovers its continuity, and re-acquires its functions, he asked himself the question, if what took place between the two extremities of the same nerve, would not equally happen between the extremities of different nerves when placed in juxtaposition; to solve which problem, he undertook a series of experiments, by which he established the following facts:—

1. If two neighboring nerves are included in the same ligature, with the view of dividing them both at the same time, there is developed between their four cut extremities a sort of nerve-like ganglion, (*ganglion nerviforme*,) which is common to them, and in which the fibres of the two nerves and their functions appear to be blended;

2. If the section of two nerves that are separated but a short distance apart, is made in such a manner, that the upper extremity of one is placed in contact with the lower extremity of the other, the result is the formation of a nerve which preserves its functions entire.

The practicability of thus *engrafting one nerve upon another* being

established, a route is opened for new experiments calculated to give greater elucidation to the physiology of the nervous system.

The fact had already been established in respect to the practicability of uniting, or engrafting by suture, the cut extremities of an extensor tendon of the middle finger to those of the adjoining fingers, which last thus served to execute the movements required of the wounded finger, (See Vol. I., p. 409, 410, &c. ;) but we are not aware to what object of practical utility, so far as a new direction to, or channel for, the distribution of the nervous fluid, either in neuralgia or any other disease, this engrafting of nerves could be applied. It seems to be evident that in neuralgic affections, as of the face, at least, which often involve so great an extent of nervous distribution, the grafting of two adjoining nerves in the manner described, could not afford any relief to the disease.

It appears that at the same meeting of the Academy of Sciences, (*Gaz. Méd. de Paris*, Jan. 18, 1845, p. 46,) that M. Flourens claimed priority of Dr. Taignot, on the subject of engrafting nerves, having made and published many years since a series of experiments similar in every respect, as to their character and results, to those of M. Taignot. He has thus seen effected the union of many nerves crosswise, (*réunion, croisée*,) for example, that of the superior with the inferior nerves, of the brachial plexus, and even that of the cervical nerves with those of the pneumo-gastric. In every case the *union was complete*, and in some of them there was a perfect restoration of the functions, (Vid. *Mémoires de l'Académie des Sciences*, Paris, Tome XIII., p. 14, et suiv., and the work of M. Flourens, entitled, *Recherches Experimentales sur les Fonctions du Système Nerveux*, &c., p. 272, et suiv.) T.]

## SECTION NINTH.

### AMPUTATION OF THE LIMBS.

#### PART FIRST.—AMPUTATION IN GENERAL.

AMPUTATIONS being the last resource of surgery, should not be performed but as a desperate remedy. Always in itself a serious operation, it necessarily involves the mutilation of the patient. Nevertheless, in cases which seem to require it, the practitioner, without forgetting that the aim of surgery is to preserve, *not to destroy*, and that we acquire more honor in saving a limb than in skilfully performing a *great number of amputations*, ought not to keep out of view that it is better to sacrifice a part than to let the whole perish, and that patients prefer *life with three limbs* than *death with four*.

The necessity of sacrificing a portion or the totality of a limb must have been experienced at every epoch. It would seem, however, that in former times this operation was rarely undertaken. The Hippoeratis give but few details on this subject, and Celsus is the first who has furnished us with a tolerably accurate description of this operation. The ancients, being but imperfectly acquainted with the circulation of



the blood, and ignorant of the means of guarding against hemorrhage, must have had constantly before them the apprehension of a fatal termination as often as the question came up of taking off a limb of any considerable magnitude. On the other hand, before the discovery of gun-powder, national wars being less destructive in their tendency, naturally rendered amputation less frequently necessary than it has become since. At this early period they confined themselves to the separation of the dead parts, without touching the living tissues, and this practice, which was continued among the surgeons of the middle ages, is also recommended by Fabricius ab Aquapendente.

Though the ancients rarely speak of amputation except in cases of gangrene or corroding ulcers, we find, however, that they had at an early period become aware of the necessity of dividing the tissues above the mortified parts. Celsus (*De Re Med.*, lib. VII., cap. 33,) formerly recommended it, and Archigenes of Apamea appears to have performed it frequently. Always alarmed at the idea of hemorrhage, they invented a thousand contrivances (at the present day forgotten,) by which they could prevent it, and thus made amputation an operation so terrible that many among them preferred abandoning their patient to certain death. Some commenced with securing the vessels by inserting a ligature through the whole thickness of the limb; others by strangulating the entire contour of the limb itself and sprinkling cold water upon it. The operation being finished they burnt the surface of the stump with a red hot iron or with boiling oil.

Albucasis, less timid than the others, says:—"When we cannot preserve a limb we must cut it off as high up as the sound part since the death of the whole body is a greater evil than the abstraction of a limb." Guy (*Traict. 6, Doctr. I.*, chap. 8, p. 469) advises that we should cut a little above the diseased tissues, "at the place where upon introducing the tent there shall be found a resisting texture and pain. For that purpose the limb was first held firm by the assistants; the soft parts were then divided with a razor down to the bone; after which the lips of the wound were protected by a compress that they might not be injured by the saw; finally the surface of the stump was cauterized with red hot iron or boiling oil.

It is not certain, however, that this method was adopted by Guy de Chauliac, for he soon after adds:—"As for myself I envelop the whole mortified limb with a plaster, and I keep this on until the separation is complete, and that it falls off of itself; which is more humane in the physician than if he cut it off, for when it is cut off there always remains behind a grudge in the mind of the patient who thinks that it might have been preserved to him." (*Operat. cit.*, p. 466.) It is doubtless this passage which has given rise to the idea that Guy strangulated the limb or a bone on a line with the articulation by means of a ligature, in order to bring about its separation, an error which M. Dezeimeris (*Dict. de Méd.*, 2d ed., t. II., p. 479) has established in the most conclusive manner.

Notwithstanding the efforts of Paré to induce the adoption of the ligature upon the vessels after amputations, Pigray, Dionis and Rossi, still prefer the actual cautery in certain cases; but this barbarous practice has long since been proscribed from surgery.

At the time of Hippocrates (*Op. cit.*, p. 466) amputation of the limbs was most usually performed at the joints. This practice prevailed also among the Arabs, for we are told in their works that if the disease extends to the neighborhood of the joint, amputation must be performed at the joint itself by means of a razor or other instrument in place of the saw, (*Dict. de Méd.*, 2d ed., t. II., p. 479.) The method of Celsus, though advocated by Gersdorf of Strasburg, and by De Cervia a long time before, and by Maggi and some others afterwards, was however abandoned by most practitioners; insomuch so that in the seventeenth century Botal had the courage to eulogise a surgeon who was in the practice of placing the limb upon the cutting edge of a hatchet, fixed in a solid position, and then letting fall upon it from an elevated point another hatchet to which an additional weight was given by attaching to it pieces of lead. Finally, to set out from Ambrose Paré and Wiseman, the practice in this respect has entirely changed; since which time amputation of the limbs has become much less dangerous.

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## CHAPTER I.

### INDICATIONS.

The cases that require amputation demand the most careful consideration, and will become, it is hoped, less and less numerous in proportion as the healing art advances, and the correct mode of treating diseases shall be more and more diffused.

#### ARTICLE I.—LIMBS ALMOST ENTIRELY DIVIDED.

If the limb is in great part separated from the body in consequence of the wound itself, the idea naturally suggests itself immediately of completing the amputation. It is important, however, not to decide upon it too precipitately; I have shown in the chapter on anaplasty, how many organs we have it in our power to restore, when there had been reason to suppose that their removal was indispensable.

In the case of the fingers when held only by a small strip of skin, and which reunite perfectly well, the question, as M. Champion says, has long since been put at rest by all practitioners. I have before me as many as thirty examples of this kind gathered from the practice of others, and I could augment the number by a dozen cases taken from my own, among which there was one in which from the contusion with which the wound was complicated, it was apprehended that the attempt at reunion would prove abortive.

Of all these facts the most curious is that related by Bagieu, (*Exam. de plus. Parties de la Chirurg.*, 1757, 2 vol., 12mo,) where a ring finger reunited with the nail turned round in front. The patient mentioned by Forestus, (*Bonnet*, t. III., 140, liv. 2, obs. 51,) had had the whole hand divided with the exception of the outer and posterior por-

tion. In that of Charrière, (*Gaz. de Santé*, 1780, No. 24, p. 95,) the four last bones of the metacarpus had been divided by the stroke of a hatchet, and were retained only by a small strip of skin near the thumb. In one of those of Bagieu, (*Op. Cit.*, t. II., p. 596,) the wound went through the entire thickness of the two last metacarpal bones. Salmon (*De Artium Amputat. rar. admittenda*, § 19, sect. 2, 1777) relates cases in which the right fore-fingers had been bitten by an ass, and were nevertheless restored. Harbicht (*Bibliot. Chir. du Nord*, p. 188-189) relates two cases where the hand was *almost entirely cut off*, in one of them by a contusion, but which notwithstanding recovered. I have elsewhere cited the observations by Jung and Hoffman. In another case, (*Mecure de France*, 1755, t. I., p. 202; *planque*, t. XXVII., p. 49,) it was the wrist which was restored, after having been *almost entirely separated*. In a patient of Talabère (*Ques. et Obs. Chir. Prac.*, *Thèse de 1804*, p. 17, § 42, Strasb.) all the muscles of the middle portion of right fore-arm, the radius, and the radial and interosseous arteries had been divided by a sabre-cut, but were nevertheless restored. An *Arm*, wounded in the same manner by a bullet, was, if we may believe Forestus, restored in the same way by J. Carpius, (*Bonet*, t. III., p. 126, liv. de Forestus, obs. 24,) and Demarque (*Traité des Bandages*, 347) was no less fortunate in a patient who had had the arm divided by the cut of a pruning knife. The surgeon, Désire, (*Bonet*, t. VII., p. 528, obs. 81,) succeeded equally well in a similar case. The same occurred with a wounded patient, treated by Seeliger, (*Anc. Journ. Méd.*, t. LXVI., p. 356; et *Bibliot. Chir. du Nord*, 116,) though there was a considerable destruction of the soft parts; and Bordenave (*suppl. à la Chirurg. d'Heister*, p. 50, art. 8, in octavo) has collected a number of facts of the same kind. The case of a foot, the greater portion of which was separated, and yet reunited, is related by Ledran, (*Consultat. Chir.*, p. 61, *plaie derrière le gros orteil jusqu'au petit*.) Cartier, (*Medical Facts and Observations*, t. II., London, 1792,) who relates a similar case, says the wound was complicated with luxation of the foot inwards, and he mentions having seen a man aged 60, with fracture and solution of continuity at the lower part of the leg, and which left nothing remaining but a small portion of the gastrocnemii or of the soleus, recover in thirty-six days.

To understand what reliance we ought to place upon these facts, and what is their actual value, I refer to the examination I have made of them under the article on organic restitutions.

## ARTICLE II.—GANGRENE.

Though sphacelus formerly was the only lesion for which amputation was deemed necessary, it is not in reality the one which most frequently requires it, though it still constitutes one of its most positive indications. Before this can happen, it is necessary that the gangrene should have attacked the entire thickness of the part, and that it should at least be so deep-seated as to leave no hope of saving the principal tissues.

In its connection with amputation, gangrene involves a question which some moderns have attempted to solve in a way quite different from that



of the ancients. Pott and (before him) Snarp earnestly insisted that we should always wait until the organism had arrested the progress of the mortification, before we should think of amputating; otherwise they contend that we run the risk of seeing the gangrene invade the stump, and may thus perform a painful operation when there is no necessity for it. This manner of viewing the subject, based as it is upon an accurate observation of facts, should be adopted as a general, but not as an absolute, rule. MM. Larrey, (*Clin.-Chir.*, t. III., p. 520-553,) Yvan, (*Dissertat.* No. 425, Paris, an XIII.,) Lawrence, (*Medico-Chir. Transactions*, vol. VI., p. 184,) Dupuytren, (*Leçons Orales*, etc., t. IV., p. 262-265,) Gouraud, (*Princip. Op.*, etc. 1815,) Guthrie, Chaussier, (*Bullet. de Férussac*, t. XIV., p. 362,) Labesse de Nancy, (*Archiv. Gén. de Méd.*, t. XVII., p. 307,) Macdermott, (*Journ. de Progrès*, t. X., 235,) and Busch, have clearly shown that it is sometimes prudent to adopt an opposite line of conduct, and to perform the amputation before the gangrene is arrested. That this subject may be well understood, it is proper to consider separately each kind of gangrene.

### § I.—Inflammation.

It rarely happens, at the present time, that the surgeon allows inflammation to go on to the extent of producing gangrene in the body of the limbs. Deep, free, and numerous incisions, the liberal application of leeches, and large temporary blisters, mercurial ointment, regulated compression, and extensive dilatations, almost constantly arrest the progress of the evil, not only under the skin, but between the muscles and in the tendinous and synovial sheaths. The great articulations only would constitute the exceptions, and to these I shall return farther on. Nevertheless, if the gangrene shall not have ceased, and may have proceeded to the extent of involving the entire thickness of the part, the finger or foot for example, still, if it shall not appear to be complicated with inflammation of the large vessels above, there is good reason for amputating; otherwise we must put it off. A young man, in the year 1824, was received at the hospital of the Faculté for a wound under the ankle, Gangrene commences; the limb is amputated; gangrenous patches make their appearance on the stump, and finally upon the thigh. The patient dies, and it is found that there has been phlebitis, together with metastatic collections of pus in the interior.

### § II.—Hospital Gangrene.

The species of *gray gangrene*, known under the name of hospital gangrene, does not by any means always require amputation. Ulcers around the nails are so frequently the seat of it, as to lead to the belief that there is a necrosis of the phalanx and necessity of amputating the finger. Free cauterization, however, of all the bleeding or mortified surface, by means of the nitric acid of mercury, or even by the red-hot iron, has always enabled me, in such cases, to arrest the disease and preserve the finger provided the bone was not yet necrosed. I have ascertained that the same method applies equally well upon other parts of the members; but if the surface which is to undergo the transmutation

should be very extensive, the red-hot iron is to be preferred, since the application of a large quantity of the acid upon the wound might not be unattended with danger. Supposing that the diseased limb should have to be amputated, previous cauterization, nevertheless, should not be omitted, since this gangrene is of a character to attack the wound from the operation as well as the primitive wound. Though Paulet (Pierron, *Thèse* No. 112, Paris, 1814) and others may have flattered themselves that they saved their patients by amputating, I have to remark that many of those in whom the dressing was confided to me, at the hospital of Tours, in 1816 and 1817, were re-attacked with gangrene after amputation.

### § III.—*External Violence.*

If the violence which has caused the mortification is a simple constriction or strangulation of the limb, it is perfectly useless to wait for the limitation of the gangrene. A young man, aged 24, who had been bitten by a viper, strangled his leg with a cord. The limb mortified and separated, and the sphacelus proceeded no farther, (Delacroix, *Arch. Gén. de Méd.*, 2e série, t. II., p. 587.) In a similar case, M. Petitot (*Id.*, p. 592) amputated above the gangrene, and succeeded. The patient upon whom Park (*Excisions of Various Joints*, 1805, p. 64) amputated, after having tied the artery for popliteal aneurism, also recovered. A young man was attacked with gangrene in consequence of a contusion of the femoral artery; he was amputated, and recovered, (*Mélang. de Chir.*, p. 212.) Josse (*Ibid.*, p. 243) also speaks of another case, in which the femoral artery, wounded by the fragments of a fracture, brought on gangrene, and in which amputation was attended with the same advantage. I have performed amputation in six cases where the mortification caused by wounds was constantly extending: twice in the arm, and four times in the thigh. M. Erard at Saint Mihiel, and M. Thomas at Revigny, have both, as M. Champion writes me, amputated the thigh under similar circumstances; and all their patients recovered. Other practitioners, however, have been less successful.

In a fracture near the knee, one of the fragments compressing the popliteal vessels caused sphacelus of the leg. M. Smith, (*Gaz. Méd.*, 1839, p. 43,) who amputated the thigh before the arrest of the gangrene, cured his patient. In the case of M. P. Eve, (*Lanc. Franc.*, t. xii., p. 540,) the gangrene had reached the thigh, and amputation was performed in a line with the trochanters. The cure was effected in six weeks. M. Morisson, (*Ibid. Méd. Chir. Rev.*, Oct., 1838,) in amputating the thigh to arrest a gangrene of the leg, caused by a wound from fire-arms, was not less successful. A traumatic lesion was succeeded by gangrene; the leg, says M. Malle, (*Thèse de Concours*, Strasb., 1836, p. 26,) was amputated, and the patient died with an emphysema of the stump. I tied the femoral artery for a popliteal aneurism, and gangrene of the leg supervened; amputation was performed at the thigh: in the evening the stump became emphysematous, and on the following day the patient died. A similar case has just been published by M. Lauchlan, (*Gaz. Méd. de Paris*, 1838, p. 487.) Unless, therefore, we should decide upon it, as is recommended by Mehée, (*Plaies d'Armes*

*a-Feu*, p. 214,) on the very first appearances of mortification, I should advise, in cases of ligature of arteries or aneurisms, that we should not proceed to amputation until after the limitation of the gangrene.

If the process of obliteration of the vessel is already going on during the operation, the amputation will not arrest it, and the gangrene will continue. If the process is suspended, and we do not amputate, the mortification will be arrested of itself. The patient of M. Thomas (*Arch. Gen. de Méd.*, 2e série, t. XII., p. 490) was cured in consequence of this fortunate coincidence. The same may be said of that of M. Campbell, (*Gaz. Méd. de Paris*, 1833, p. 151;) also, doubtless, of those of M. Delaunay, (*Bulletin de la Faculté*, t. VI., p. 197,) Delpech, (*Pereis des Malad. Reput. Chir.*, etc.) M. Sédillot, (Malle, *Thèse de Concours*, Strasbourg, 1836, p. 25,) and M. S. Cooper.

[Mr. Fergusson thus states his experience in amputating during spreading gangrene:

"I have in my recollection six cases in which I amputated during spreading gangrene, four times in the thigh; (one of them being for a simple fracture of the leg, another for compound; both close upon the ankle; the third following spontaneous obstruction of a popliteal aneurism, and the fourth after ligature of the femoral artery for a similar disease;) once (being the fifth) in the leg for severe lacerated wound of the foot, and once (the sixth) at the shoulder joint for extensive injury of the arm. None of these succeeded. I might possibly in future resort to a similar practice, but should feel greatly inclined to wait for a line of demarcation, though even here, I should not be very sanguine as to the result" (*Pract. Surgery*, 3d Lond. ed. p. 112.)

Mr. Guthrie seems to have come to a different conclusion, as may be seen from the following quotation:

"The result of amputations, after a line of separation had been formed, during the Peninsular war, was not favourable; it was in fact so much the reverse, when the constitution of the sufferer was impaired by disease or was otherwise unsound, that I was led to abandon it in many instances, and to adopt a different proceeding" (*On Wounds and Injuries of Arteries*, London, 1846. p. 23.)

Mr. Erichsen amputated at the shoulder-joint for spreading gangrene of the limb and although the infiltration had extended as high as the scapula, the patient rapidly recovered.) *Science and Art of Surgery*. Lond. 1853. p. 94.)

Mr. Jonathan Toogood in his "*Reminiscences of a Professional Life*" relates two cases of amputation in spreading gangrene, and in both instances the patients recovered. In one it was performed just below the knee, in the other close to the shoulder-joint. The gangrene in these cases was the result of injury. G. C. B.]

#### § IV.—*Spontaneous Gangrene.*

Were spontaneous gangrene always dependent upon a diseased condition of the large arterial trunks, we ought by no means to amputate until its progress has been arrested. If the cause remains, it is evident that the removal of the dead portion will not prevent the remainder from becoming gangrenous. I amputated in the body of the first bone



of the metatarsus, in a case of gangrene from old age, [gangrena senilis,] in the great toe. The foot was soon attacked, and the patient died. Another case had been affected with gangrena senilis for four months. I amputated at the knee; the flaps of the wound mortified, the gangrene extended to the thigh, and life terminated on the thirty-second day. But I am satisfied that the vessels are not always obstructed in spontaneous gangrene. Among the numerous examples I have in my possession, I select the two following:—A thin, small-sized woman, aged 54, died at the Hospital of La Pitié, in 1833, of a gangrena senilis which occupied the whole fore-arm. The most minute dissection in this case did not enable me to detect the least degree of lesion either in the arteries or veins. When I entered upon service at La Charité, in March, 1835, I found a patient there in whom spontaneous gangrene had successively invaded the legs, the thighs, one arm, and the nose. All the vessels that could be identified were, nevertheless, found permeable, nor did the heart appear to be diseased. It is manifest that the etiology of gangrene requires farther investigation. If we can suppose that the large arteries remained permeable in the limb in the cases operated upon by Hennen and by McCready, (*France Méd.*, t. I., p. 96,) in one of those of M. Josse, (*Méd. de Chir.*, p. 20,) and in many of those that have recovered, though the gangrena senilis with which they were attacked had not become limited when amputation was performed, this condition of things did not exist in a great number of other cases. Moublet (*Bull. de la Fac.*, 7e année, p. 227) and M. Roux, (*Voyage à Londres*, p. 53,) each cite a case where the arteries were so entirely obliterated that no ligature became necessary after the amputation. A fact of the same kind is related by Ansiaux, (*Clin. Chir.*, 2e edit., p. 278,) and I have collected elsewhere (*Journ. Hebd. Univ.*, t. I. et II., 1830, 1831,) a number of others. Here is one of the most singular and, at the same time, one of the most curious. M. Champion writes me:—"I have amputated the leg in a case of gangrene of the leg supervening from a slight kick from a horse upon the middle and outer part of the thigh. The patient was about 60, thin, but strong and robust. The mortification presented all the characters of dry gangrene; the femoral and popliteal arteries indicated no pulsation, and I deemed it proper to wait until nature should trace out for me the demarcation of the disease before I proceeded to amputate, although she clearly indicated that the external violence was the determining cause. None of the three arteries emitted blood during nor after the operation; I found the posterior tibial only, to which I applied a ligature around a small plug of wood, which, as I had no wax, I introduced into the extremely narrow aperture of the ossified vessel. The superficial soft parts alone, on the outer side of the leg, presented two small arteries for the ligature. Union was effected by the second intention, and the patient at present enjoys perfect health. I do not know an analogous fact, and I consider it one that possesses some interest for medical jurisprudence."

I will remark here, that the three cases that died out of the seven in which M. Porter (*Gaz. Méd. de Paris*, 1833, p. 866) states that he amputated the leg for gangrene which had not become limited, did not die from the effects of the extension of the mortification. In all of them the stump retained its vitality, and without any trace of gangrene

up to the termination of life. M. Segond (*Gaz. Méd.*, 1837, p. 523) having thus amputated the arm, lost his patient on the twenty-second day, owing, says the author, to his having abstained from taking any sort of aliment after the operation. Three patients, on the contrary, in whom amputation was performed on both legs at the same time by M. Luke, (*Ibid.*, 1839, p. 104,) for gangrene of the feet, the consequence of typhus fever, recovered.

Unless we adopt the precept of Wiseman, that we ought to amputate before the appearance of delirium, in order that the patient may have sufficient strength to sustain the operation, it is exceedingly difficult on this subject to lay down rules. For my own part, I regulate myself by these principles; if the general health is good, and the digestive functions unimpaired, if the arteries pulsate as usual, and are free from pain under pressure, and the disease progresses slowly, do not wait for the gangrene to become limited; but whether the pulsations are perceptible or not, should the arteries on the large veins seem to be the seat of an irritation, of a diffused inflammation, and violent and continued pains, and should the pulse be irregular, the tongue slimy, and the bowels constipated, be not in a hurry, but allow the disease to become arrested.

When amputation is once decided upon in case of *non-limited* gangrene, the surgeon should always operate at a sufficient distance from the disease. Without this precaution, he would inevitably leave germs of sphacelus within the stump, and I do not think that any one would then attempt union by the first intention.

[In two cases Dr. Mott has amputated the legs, and in one instance the thigh, for gangrena senilis, without waiting for the disease to be arrested. The amputation of the thigh, and of one of the legs were successful. Prof. Parker has operated in a case, under the same circumstances, with success. Mr. Langstaff removed the leg of a man seventy years of age, affected with dry gangrene, but although the stump healed kindly, the patient died from angina pectoris seven weeks after the operation. Mr. Crisp (*On the Blood-vessels*) has given the details of four cases in which he operated, with success, but in these the patients were comparatively young, and the line of demarcation had formed. Dr. Pitney of Auburn, N. Y. conforming to the rule laid down by our author of operating in non-limited gangrene, at a sufficient distance from the disease, was accustomed to amputate through the thigh for gangrene of the foot or leg.

Mr. Fiddes has reported in the *Ed. Monthly Journal*, for March, 1848, an interesting case of mortification of the lower extremity, from spontaneous obliteration of its arteries, in a patient 23 years of age. There was ossific transformation of the femoral artery. Amputation was performed first below, and afterwards above the knee, and Mr. F. declares his belief that the young man's life was saved by his departing from the established principle which forbids amputation in idiopathic mortification, so long as there is no line of demarcation between the dead and living parts. His error consisted in not performing the operation in the first place above the knee.

A most extraordinary case is reported in the *Charleston Medical Journal*, Vol. IV. p. 301, 1849, in which Dr. Jarrott successfully per-

formed amputation of the leg for gangrene of the foot, on a negro 102 years of age! G. C. B.]

### § V.—*Congelation.*

In gangrene from congelation, [i. e., from freezing or cold. T.] we should always wait until it becomes limited, before amputating. In these cases, the disease is entirely external, and the vital action has a constant tendency to restrict it to narrow limits. If the limb is not of large size there is no serious inconvenience, even in giving time to the eschars to become slightly detached. We may amputate as near the disease as the flaps to be formed will admit. The operation has then every chance of success. In 1838, I saw a case of a peasant in whom all the fingers came away in this manner. The excision of the head of the bones of the metatarsus in this case was sufficient to allow the soft parts to cover the bones perfectly.

M. Hysern, of Spain, in 1829, amputated both feet at the tarso-metatarsal articulations. The patient was but ten years of age, and the gangrene (from cold) was already limited by a regular inflammation. The case was completely successful.

[In the opinion of Dr. Mott, there is, perhaps, no seaport or other city in the world, where practitioners have such ample and frequent opportunities of studying this disease, as at New York. The long-continued severity of our winters, and the extremely tempestuous and dangerous character of our coast in that season, and our proximity, at the same time, to hot latitudes, and the immense extent of our commerce with such latitudes, whether with the West Indies, South America, Africa, or the Asiatic tropics and China, render this affection one of the commonest occurrence every winter among the crews of vessels arriving from such countries upon our coast, who being prevented, by violent storms and contrary winds, from entering our ports, are thus imminently exposed to every variety of frost-bitten limbs. It is particularly noted, that the crews of what are called wet ships, or such as during this perilous coast-navigation frequently ship seas, generally escape, as their feet are almost constantly immersed in water on deck, and therefore in a temperature above the freezing point. This casualty of inflammation of the extremities ending in gangrene, and resulting from exposure to cold, is, as we have said, of such frequent occurrence, that its treatment is exceedingly well understood in all our hospitals, those being the places where nearly all this class of patients are received. Dr. Mott coincides with the general observation of practitioners in saying, that not only the phalanges of the toes and fingers, but all the metacarpal and metatarsal bones, and the entire foot, and frequently both feet or both legs or arms, are, after the limitation of the gangrene is well defined, amputated under such circumstances and almost invariably with perfect success. For it must be remembered, that this species of gangrenous inflammation is of the mildest and least malignant kind, generally occurring in young and healthy seafaring subjects; that it is disconnected, for the most part, with any constitutional taint; and is purely a local affection. In addition to the observations of Dr. Mott, I may remark, that I noticed it frequently while I was Physician to



the Seamen's Retreat, Staten Island, (New York,) and that it occurs to me here, as not irrelevant, to refer specially to a case of a sailor in the prime of life, in whom, by the malpractice of the official person under whose care he had previously fallen, there was established, by the prolonged and unmedical application of *poultices*, a *permanent* or chronic gangrene of *some months*, in all the phalanges of the toes. These bones successively *rotted out* under the system of poulticing, and when he was brought to the Retreat, his feet presented the case of two stumps with red flabby granulations, and the anterior extremities of the metatarsal bones protruding out beyond the flesh to the distance of an inch or more, and having the appearance of black burnt brands, or ends of beams in the framework of a building half consumed by fire. These necrosed neglected projections were clipped off by a pair of common strong nippers, close to the sound flesh, and until the fresh bleeding surface of the healthy portion of the bones was reached. The effervescing cataplasm of bark, yeast, charcoal, and alcohol, was applied for a few days, followed by adhesive straps, bringing the flesh well and firmly in every part over the ends of the bones, which, with tonic treatment internally, rapidly completed the cure. T.]

## § VI.

Deep burns are in the same relation with congelation, and should be subjected to the same rules. I have amputated immediately above the elbow in a woman whose fore-arm had been burned up to the humerus, and the operation succeeded very well. In the case of a soldier, (*Delauche, Oper. cit.*, p. 45,) amputation was performed above the carpus and tarsus in all the four extremities for gangrene from cold.

[Mr. Spence, of Edinburgh, has reported in the *Monthly Journal*, for February, 1848, an interesting case of amputation of the arm for the secondary effects of a burn. The arm presented an almost continuous ulcerated surface, which was discharging profusely, and had reduced the patient, a girl eleven years of age, almost to a skeleton. The operation was the means of saving her life. G. C. B.]

## § VII.

When a *traumatic lesion* is the cause of the accident, when it proceeds from the rupture of an artery or the division of the vein and principal nerves of the limb, or from mechanical strangulation of the part; when, in fine, mortification does not seem to be connected with any general lesion or any internal or concealed cause, we cannot perceive what great advantages are to be obtained by procrastination. In such cases the gangrene is to be considered as a cause of gangrene, and as soon as it is well established the patient cannot be otherwise than benefited by a speedy removal of the mortified parts.

If the gangrene on the other hand arises from the spontaneous obliteration of the artery or principal vein of the limb, it is perfectly clear that the amputation will not prevent it from extending. Success then depends upon chance; and under such circumstances prudence requires that we should wait. Everything, therefore, depends upon our

accurately distinguishing these two classes of circumstances from each other.

### § VIII.—*Aneurisms.*

For aneurisms and wounds of large vessels we now have means of success more simple than amputation. If Fenelon (Bagieu, *Examen de plus. Qu. de Chir.*, t. I., p. 141) who died from the immediate effects of a puncture of the femoral artery, in the presence of the surgeons of the court, had lived a century later, his wound would have inspired but little inquietude; and it is surprising that the preacher whom M. Pl. Portal (*Clinic. Chir.*, t. I. p. 181) speaks of should have escaped from becoming the victim to a similar accident. The ideas of Pétit and Pott on this subject are rarely applicable to the present times, and cannot be adopted except in cases where the gangrene is imminent or already established. Aneurism of itself does not necessarily involve amputation of the limb unless the tumor be too voluminous and has caused degeneration to the surrounding parts to such depth that the ligature to the artery which is the seat of it presents not the slightest chance of success. When secondary hemorrhages, after applying the ligature, have supervened from ossification of the arteries; or when the principal nervous trunks have been divided or the vein closed at the same time with the artery; when the muscles shall have become softened or disorganized in any manner whatever, the articulations also in the neighborhood involved, and the bones friable and more or less completely destroyed; aneurism and arterial diseases may then have no other resource than amputation. It was for these reasons that it was found advisable to disarticulate the arm in a case at the Val-de-Grâce, in 1812, and that M. Auchingloss recently found himself obliged to recur to the same operation for an arterial lesion in the hollow of the axilla. I have stated above what we have to expect from amputation when gangrene has attacked the limb after the operation for aneurism. If M. S. Cooper has been successful, it is because the mortification of the limb had less tendency in his case to extend itself upward, than in that of M. Lauchlan and mine.

[Mr. Syme has twice amputated at the shoulder joint in desperate cases of axillary aneurism, and we have already alluded to the proposition of Mr. Fergusson to amputate at this joint for aneurisms seated on the subclavian artery, instead of tying the latter on the tracheal side of the sealeni museles. G. C. B.]

## ARTICLE IV.—FRACTURES AND LUXATIONS.

### § I.

*Compound Fractures* are among the accidents which most frequently require amputation of the limbs. To justify this, however, it is necessary that the injury should be accompanied with serious lesions of the soft parts.

A. When *outside of the articulations*, and so long as the artery, vein and principal nerves are not ruptured, and the muscles preserve a portion of their continuity, it is advisable to delay. If fragments or splin-

ters of bone are detached and buried in the midst of the tissues, they are to be removed. If either extremity of the fractured bones protrudes outside and we cannot reduce it in spite of the dilatations which sound practice authorises, it is proper to remove it by the saw, (see *Excisions*.) Even though the muscles be contused and reduced to a pulp, it does not, therefore follow, provided the tendons of some of them remain uninjured and the circulation of the fluids below the fracture is not interrupted, that the limb should necessarily be sacrificed, especially if it is an upper extremity.

Three adults having fractures of this description were cured without amputation in 1829 and 1830, at the hospital of St. Antoine while I was in service there, though two of them, suddenly seized with delirium, tore off the dressings, and marched into the hall, on the sixth or eighth day from the accident. I saw a young man at the hospital of Perfectionnement who had nearly all the muscles of the anterior and inner side of the arm and the skin on this part also stripped off and lacerated, by an injury from a spinning machine, and who, though he had at the same time the radius and ulna fractured in two or three places, finally got well and saved his limb. In private practice we should never lose sight of these facts; that, with care and proper regimen and all the resources of a judicious treatment, it is rare that compound fractures immediately require amputation.

A woman, thrown from a carriage, had the left leg crushed; the bones and centre of the limb were reduced to a pulp, the livid color which extended to the thigh, and the swelling and tension, joined with the slight degree of pain that the patient complained of, induced the assistants to propose amputation. Seeing no wound of the skin, I applied a bandage and resolvents. No accident supervened, and the cure took place as in a simple fracture. Another woman came into La Charité, who had been crushed in a diligence; amputation seemed urgent, and I was sent for. The right thigh which was mashed, as well as the knee, was transformed into a sort of bag of bones, and as moveable as the limbs of Punchinella. An enormous effusion of blood occupied its whole extent, but the *skin was only excoriated*. The compressing bandage, and afterwards the starch dressings were applied, and everything went on as well as in a simple fracture.

B. I have seen so many of these cases that they never now give me any alarm, and I never amputate under such circumstances, not even though the fracture implicates the *large articulation*. In throwing herself from the fourth story, a young woman fell on her feet before striking her forehead upon the pavement, and crushed the tarsus and the inferior extremities of the bones of both legs. I found the tibio-tarsal regions completely reduced to a pulp, while the fracture of the cranium precluded at first all idea of amputation. This woman was submitted to the treatment with the starched bandage, and was perfectly cured.

But if the soft parts are extensively crushed and lacerated down to the bones, the question assumes another aspect. Wherever the injury involves an extensive articulation, the foot, knee, hand and elbow for example, amputation is then to be preferred. In the lower limbs it should be performed, even though the joints are not laid open. In the



arm, on the contrary, it is rare that fractures complicated with wounds and lacerations of the soft parts, do not admit of preserving the limb, provided the articulations are uninjured. A man was admitted into the hospital with the humerus comminuted. The muscles were ruptured. The skin open in two places appeared filled with pulp. The arm already emphysematous, was tumefied as high up as the shoulder. An abundant hemorrhage took place, but still the artery was felt at the wrist. I applied the immovable dressing, and the patient recovered without any accident. A woman similarly situated, and who had refused to undergo amputation, had recovered in the same way a few months before.

C. We must not, however, in these cases go too far. In the lower extremities especially these grave injuries but too often require amputation. Of three patients in this state received at the hospital of St. Antoine, and in whom I was anxious to save the leg, two died in the course of a few days, and the third owed his preservation to amputation performed on the fourteenth day on account of gangrene. It is true that a fourth, though immediately amputated, nevertheless died on the seventh day; but in him there was so little vital action after the operation, that he was scarcely conscious of what was done to him. The emphysema, which is sometimes added to the other complications of fracture, even from the first day, and before the appearance of any symptom of gangrene or inflammation, is one of those accidents which under such circumstances most emphatically indicate amputation. Though no person has hitherto pointed it out, I have noticed it in six cases, and three out of the five in whom the leg was the seat of the disease, died. Against the numerous facts stated by Bardy (*Thèse* No. 176, Paris, 1803) and De la Touche, (*Sur l'Amputation*, 1814, Strasbourg,) to show that in cases of comminuted fractures with lacerations of the soft parts, amputation is scarcely ever necessary, M. Bintot (*Thèse* No. 306, Paris, 1827) has adduced others not less conclusive, going to prove directly the reverse.

## § II.—Dislocations.

Dislocations, complicated with laceration of the soft parts, are sometimes followed by symptoms so formidable and appalling, that they were at an early period placed amongst the cases that imperiously require amputation. The remark of an army surgeon, which made so vivid an impression on the mind of J. L. Petit, and which was to the effect, that every dislocation of the foot, with laceration of the integuments and protrusion of the bones externally, was fatal unless amputation was performed immediately, has unfortunately since that time been but too often confirmed. The agonising sufferings which come on when the inflammation sets in, the gangrene which is frequently the consequence of it, and which nothing can check, and the most excruciating torments terminating in death, which last seems alone capable of arresting the march of the disease, have been deemed to be reasons quite sufficient to justify the surgical law upon this subject.

Experience has, nevertheless, demonstrated that this rule has numerous exceptions; which J. L. Petit himself has taken the precaution

to point out. M. Laugier, (*Thèse* No. 51, Paris, 1823,) M. Arnal, (*Journal Hebdomad. Univ.*, t. I., II., III.,) &c., have also furnished additional evidence of this fact. If the laceration is not excessive; if the bones are merely luxated without being broken; if the nerves and principal vessels are not ruptured; if, in fine, gangrene should not appear inevitable, we should replace the parts, excise the bones, or have recourse to dilatations, and not at first proceed to amputation, except under an opposite condition of things; that is, where the teguments, tendons, ligaments and capsules of the joints are extensively lacerated, the bones and soft parts at the same time both torn and crushed, or violently contused, and the articulation too much implicated or of too little importance to be saved without the risk of danger.

A. As to the election which is to be made in these cases between exsection and simple reduction, this is shown by the state of the parts. In the upper extremities, says M. Champion, I prefer simple reduction to exsection, because this latter is so frequently followed by ankylosis. Exsection, whatever may be the locality of the luxation, becomes absolutely necessary wherever the extremities of the bones are denuded of their periosteum, and dry and shattered. In twenty-six of these cases collected by M. Patry, (*Thèse* No. 289, Paris, 1837, p. 26,) from La Motte, Coligny, Dupuytren, A. Cooper, and Thierry, three only died. In the foot, even reduction may be preferable; though the formidable accidents which follow wounds with luxation of the tibio-tarsal articulation, would induce me to adopt, with M. Champion, exsection to simple reduction, if the latter was attended with the least difficulty, seeing that the removal of the extremities of the bones is so powerful a means of preventing the accidents of inflammation. Of seven cases thus treated, and which are related by Deschamps, Hey, Moreau, Cooper, de Bungay, MM. A. Cooper, Josse and Bintot, one only proved fatal. At the knee, however, amputation should be preferred to all other means, and exsection should not be attempted except in persons who are not obliged to get their living by some severe and laborious occupation. I will return to this subject farther on, in treating of amputations in particular, and of exsections. Among these cases, [of reduction. T.] though there may be some who will die that might have been saved by amputation, there will be a much greater number who will survive and preserve their limbs.

B. A remark to be attended to here is this, that whether we have to treat a fracture or a compound dislocation, should amputation become necessary, we must, as in cases of non-limited gangrene, perform it very high up. I cannot understand how Lassus, (Pott, *Traité des Fractures*, 2e edit., p. 181) should have said that it is better to remove the contused parts on a line with the fracture, than to go to the trouble of sawing the bones above it. It is so seldom, under such circumstances, that the fractured bone is free from all cracks, and that the cellular tissue, aponueurosis, and muscles are not disorganized at some inches above the apparent lesion, that there would be real danger if we did not amputate higher up. A slater had his foot crushed by the wheel of a carriage. I amputated the leg after the expiration of a few hours, and I performed the operation at three inches above the malleoli, after having asked myself the question, from the contusion appearing so cir-

cumscribed, if it would not have sufficed to have taken off the foot at the tarsus. The mortification of a part of the tegumentary ruff, and the livid color from extravasation, which soon attacked the sub-cutaneous tissues of the stump, showed us that lower down, the operation would have failed from the effects of the gangrene. In another patient the leg was shattered at its lower third. I amputated below the knee at six inches above the apparent lesion. Death ensued, and enabled us to ascertain that the contusion extended under the skin up to the thigh, especially on the outside. A third patient was more fortunate; though the leg only had been injured by the wheel of a diligence, I amputated the thigh; nevertheless, strips and pieces of mortified cellular tissue ultimately sloughed off from the stump. The same rule applies to those cases where the contusing body has separated the limb from the rest of the economy, or so to speak, has itself performed the amputation. If, under such circumstances, we do not also remove with the wounded parts themselves, all the neighboring tissues which have been injured by the blow, we may be prepared for gangrene of the integuments, diffused phlegmon, and mortification of the cellular tissue, together with denudation of the bone.

[Some five years since we treated a case of compound dislocation of the elbow, with rupture of the brachial artery, and preserved the limb. Though ankylosis exists at the elbow joint, still the boy has a useful arm. We are at present treating a case, of the same kind, in which we hope to save the arm. We have been compelled to excise the condyles and lower end of the humerus, together with the lower end of the radius, and the prospect of saving the limb, now some six weeks after the accident, is good. G. C. B.]

### § III.—*Wounds from Fire-arms.*

No wounds more frequently require amputation than those from fire-arms. It is not that the projectiles lanced by powder have in themselves anything of a poisonous nature, as some surgeons have supposed, since the time of A. Ferri, or as the vulgar are also too prone to believe; but because they lacerate, tear, contuse, or cut into the tissues they traverse or strike.

A. A ball, or biscaien, a grenade, or the bursting of a bomb or howitzer, carrying away a part of the thickness of the limb, including the vessels with it, requires amputation; while a similar wound effected by a cutting instrument would not, perhaps, make it necessary to have recourse to such mutilation. If the same missiles had struck the body of the arm or thigh so as to reduce the muscles to a pulp, without breaking either the skin or bones, still amputation would be necessary, unless the attrition should be exceedingly circumscribed, and the vascular and nervous trunks uninjured.

B. Wounds complicated with *fractures* in an especial manner, indicate this extreme alternative. In the joints, if the destruction is considerable, there is no time for delay. A difference of opinion among practitioners exists only where the joint is not greatly exposed, and where the osseous extremities have merely been traversed or fractured by a ball. In these cases we must be governed by the circumstances, thus:—where



we have it in our power to pay every necessary attention to the patient, and the ball has merely passed through the wrist, elbow, instep, shoulder, &c., fracturing the articular extremities without lacerating the tendons and other soft parts; ought we not then to endeavor to save the limb? On the contrary, on the field of battle, in hospitals crowded with the sick, and when some fatal epidemic is prevailing, and we can neither obtain quiet nor repose, nor those assiduous cares which are so indispensable, and where the fracture, too, is complicated with splinters of bone, and the ligaments, synovial tissues and tendons are bruised and torn, amputation is more advantageous to the patient than temporization.

M. Labastide, (*Thèse sur les Blessures par Armes-à-Feu*,) desirous of sustaining the principles of Bilguer, has, it is true, collected quite a great number of examples to prove that such wounds at the wrist, elbow, foot and knee, have not always rendered amputation necessary for the recovery of the patient. Similar cases noticed at the Maison de St. Cloud, among the wounded of July, as treated by Dupuytren, have been published by M. Arnal, (*Journ. Hebdomadaire*, 1830—1831. t. I., p. 385; t. II., p. 497; t. III., p. 5, 33.) Faure, Percy, Lombard, and Leveillé (*Soc. Méd. d'Emulat.*, t. V., p. 192—234,) have also reported analogous cases; but how many reverses might we not oppose to these unhopèd-for successes!

[It is stated in Dorsey's *Elements of Surgery*, Vol. II., p. 313, that Gen. Scott of the United States army, recovered from a gunshot wound of the shoulder joint attended with fracture and destruction of the head and adjacent parts of the humerus, and a wound of the axillary artery, and that he preserved a useful arm. G. C. B.]

C. The gardener of the director of one of the theatres of the capital, had a part of the metacarpus and fingers carried away by a musket which burst in his right hand. He was brought to the St. Antoine, and begged me to save the thumb and fore-finger, which were left; I yielded to his solicitations. Serious symptoms supervened and death was not prevented by the amputation of the arm fifteen days after. One of the wounded of July had his heel perforated by a ball, and the tibio-tarsal articulation laid open on its posterior and outer part. As there was not much destruction of the parts, we were desirous of preserving the limb. On the 18th day the patient died. Another patient also admitted into La Pitié, had a large wound with fracture of the elbow, and an opening into the joint. Amputation was not performed, and the patient perished like others, from the effects of purulent infection. A young man in my service had the osseous extremities, of the articulation of the knee obliquely traversed by a ball, at the taking of the Hôtel-de-Ville; there were no splinters nor any laceration of the soft parts. After a month's care we were compelled nevertheless, to have recourse to amputation of the thigh, which did not prevent death from taking place thirteen days after. It is, to say the least, probable, that had amputation in some of these cases been performed at the very onset, life might have been saved.

D. It is not in the neighborhood of the complex articulations only, that wounds from fire-arms, accompanied with fracture and with lesion of the synovial cavities are so dangerous; they are scarcely less formidable in the *middle portions of the long bones*, especially in the low

er extremities. Thus a simple ball, which breaks at the same time the tibia and fibula, and detaches also a certain number of splinters, is almost always a case for amputation. Where there is one patient, under such circumstances, who refusing to be operated upon, gets well without amputation, there are ten that die if the soft parts are at all injured or violently contused.

E. *The Thigh*.—In the thigh the indication is much more positive. Ravaton says, if we do not amputate, this fracture almost always proves fatal. Schmucker maintains, that in cases of this nature, only one patient is saved out of seven. Lombard holds the same language. M. Ribes, (*Gaz. Méd. de Paris*, 1831, p. 101,) who has seen none recover, gives the history of ten cases, in whom the utmost care could not prevent a fatal issue, and mentions, also, that at the Hôtel des Invalides, in an aggregate of 4,000 cases, there was not a single patient that had been cured of this kind of wound. M. Yvan pointed out two to him in 1815, in whom, however, fistulous openings formed, and who ultimately succumbed from the consequences of their fracture. I notice that M. Gaultier de Claubry, (*Journ. Hebd. Univ.*, t. V., p. 479; *Journ. Gén. de Méd.*, t. LVII.) formerly a surgeon of the Imperial Guard, is on this point of the same opinion as M. Ribes, and that in the army of Spain almost all the soldiers that had fracture of the thigh died unless amputation had been performed immediately. Out of eight treated by M. S. Cooper after the battle of Oudenbosh, one only survived, and he never was enabled to make much use of his limb. Percy, Thompson, MM. Larrey, Guthrie, and J. Hennen, express themselves nearly in the same terms, and the events of July, 1830, enabled most of the surgeons attached to the hospitals of Paris to recognize the truth of this melancholy prognosis.

Though one of the cases of wounds of this kind was saved by M. Lisfranc, at La Pitié, and another by Dupuytren, I had not the same good fortune; there was but one only received in my wards, and the fracture appeared to be quite simple; nevertheless we could not prevent death, which put an end to his sufferings on the 38th day. Sommé, (*Journal. Hebd. Univ.*, t. I., p. 221,) during the events at Antwerp in Oct. 1830, cured 2 cases out of 8, without amputation. Lassus, (*Gaz. Méd. de Paris*, 1830, p. 322,) and other surgeons of Paris and Brussels, have published other cases not less fortunate; but we must not forget, that among us, in Belgium, even where we have had it in our power to bestow the same attention that we habitually do to patients in private practice, the instances of success have, nevertheless, been exceedingly rare, and the limb saved has generally been so deformed, that its loss would scarcely have proved a greater source of affliction to the patient. It is to be remarked, also, that a fracture of the thigh is so much the more dangerous in proportion to its proximity to the middle portion of the bone, both because the splinters and fragments shivered off are more common in that part, and also on account of the number, arrangement, and force of the muscles.

It is painful, without doubt, to mutilate a patient, in whom the limb might have been preserved; but the argument drawn from certain unlooked-for cases of recovery, in patients who had refused the operation, has it, in fact, all the value usually accorded to it? Admitting that

in ten persons wounded in this manner, four are cured; it is certainly a good deal. But in submitting all of them to amputation at the beginning, is it not to be presumed that two-thirds of them at least would have been saved? I leave it to conscientious men to decide whether the saving of the life of two or three persons in the vigor of age, is not preferable to a deformed limb, which can only be saved, perhaps, in four cases [out of ten,] and at the risk of a thousand dangers.

[Among the most common causes, at the present day, of amputation, is the crushing produced by railway carriages in passing over limbs. These injuries seem to be of a peculiar nature, and it is only of late that they have attracted that attention from surgeons which they deserve. Dr. John Watson, of the New-York Hospital, has so happily described this class of injuries, in a communication to the Editor of the *New-York Medical Times*, November, 1853, that we feel tempted to insert his remarks in this place. After detailing some cases, he proceeds: "It is apparent that the crushing effect of railroad injuries, among the deeper tissues of a limb, is usually out of all proportion to the apparent amount of injury on the integuments; and that, from these deceptive circumstances, attempts are often made to save limbs, which, from the first, are so far disorganized as to leave no chance of their recovery. And again, even where the knife is employed early, and carried through tissues which, to appearance, still retain their healthy structure, inflammatory reaction which follows, is occasionally so severe as to lead to gangrene; which, if not arrested, may necessitate a second operation at some point higher up; or result in high irritative fever, and, finally, in the death of the patient. The primary amount of injury is not in proportion to the later consequences that too frequently result from it. The surgeon, looking at a foot with one or two of the toes crushed, may, perhaps, dismiss all solicitude; and yet, before he is aware of the true aspect of the injury, the whole is changed, and the case has assumed the gravest character; inflammation has crept up deeply beneath the fascias of the leg—the tension of the tissues interferes with the circulation; the deeper structures are deprived of their vitality, and the whole limb is implicated in the diseased action.

The part crushed, if of limited extent, may slough, and leave the surrounding soft part with force sufficient to carry on the process of reparation. But, too often, the gangrene is not thus circumscribed; and the disorganizing tendency, with or without reaction, takes a wider circuit. But where inflammatory reaction is fairly established, it may be with force insufficient to lead to fibrinous effusions, or be otherwise perverted, so as not to establish a wall of plastic lymph at the outposts of the diseased tissues. The morbid effusions, and the fluid detritus of the decomposing mass, are then allowed to work upwards by infiltration, or to be carried upwards by absorption, so as to poison all the tissues in the neighborhood, and vitiate the whole of the circulating blood. The limb now falls into putrilage, and the constitutional symptoms are of corresponding severity.

The process of reaction, with, or without the spread of the disease among the deeper tissues, leads, also to diffuse inflammation of the skin. This may assume the form of erysipelas, or be mistaken for it. In many instances, it is only such in appearance. It corresponds with it, however,



in this, that in neither of them is there any barrier set up, by the effusion of fibrine, against the spread of the disease. But the condition of the skin now under consideration has a closer connection with that which always accompanies subfascial inflammation, than with any form of true erysipelas. In the latter the cause of disease is situated either in the skin, or in the cellular tissue forming part of the common integument, beneath this; whilst in the other, every vascular tissue of the limb is equally involved, or if any be the last to suffer, it is usually the integument itself.

The spread of ecchymosis from extravasated blood, in these cases, is generally extensive, giving the greater part of the limb—especially in the track of the larger vessels, and among parts where the cellular tissue is lax—a deep purplish discoloration. But in many cases, the blood in the various tissues, muscular, cellular, and tegumentary—without having at all escaped from its proper vessels—coagulates in the capillary veins; and there, losing its color as well as its vitality, it gives to the deeper structures a dry and withered, purplish appearance, and to the skin a dusky or dingy-brown color; and when the tissue of the skin itself is otherwise implicated, and disposed to fall into gangrene, a pinkish brown color. These changes in the color and condition of the skin, from their disposition to extend, are also often taken for erysipelas; and, as I think, erroneously. In some cases, the coagulated blood thus situated, is redissolved, and carried off, so as to restore the tissues to their normal appearance. I have, in more than one instance, carried the amputating knife through muscular and cellular tissues, as well as through the skin in which this condition of the blood in them was demonstrable; and yet these cases have done well. But the extensive diffusion of this brownish discoloration is usually an unpropitious symptom; and the pinkish discoloration is always a more formidable appearance than the other. They usually come on early, within two or three days after the primary injury; and are not to be confounded with the discoloration which results from ordinary ecchymosis.

The constitutional symptoms resulting from these accidents, it is not my purpose to dwell upon. They are such as usually attend other local injuries of equal severity.

The practical deductions, then, from the foregoing observations, are, that the amount of injury from railroad accidents is apt to be underestimated; that the shock is often such as to destroy the vitality of parts in the neighborhood of the tissues first hurt; and that, if the injured parts are to be removed, the sooner the operation is performed after reaction, and the greater the care of the operator to keep at a respectable distance from the immediate line of disorganization, the better for the safety of the patient.” G. C. B.]

## ARTICLE VII.—VARIOUS AFFECTIONS.

### § I.

*Necrosis* and *caries* also, either in the middle part or in the articular extremities of the bones, find their last resource in amputation. To justify this, however, it is necessary that the evil should be extensive,

ancient, and accompanied with sufferings and suppuration which are exhausting to the patient; that it should occupy a joint or large surfaces, and be surrounded with fistulous ulcerations or deep-seated devastations in the soft parts; that the bone should be diseased throughout its whole texture, if it is in the continuity of the limbs; and that we cannot count upon any reproductive action from the periosteum: but it is important, in such cases, not to forget that the organism possesses great power, and that art, at the present day, has at her command the means of removing the bones in part, without removing the limb, provided the soft parts are in a condition to be preserved, (See *Trephining and Exsection*.)

### § II.—*Cancerous Affections.*

Spina ventosa, osteo-sarcoma, and colloid, hydatid and erectile degenerations, affecting the bones, also frequently require amputation. These affections are of such a malignant character, that we deem ourselves particularly fortunate in being enabled to destroy them effectually, even at the sacrifice of the part in which they are seated. Unless they should occupy an exceedingly superficial, long, or small-sized bone, easy of excision, we should not hesitate a moment about amputating. If the soft parts are also implicated in the degeneration, amputation becomes a case of necessity. It is the same with fungus hæmatodes, as soon as it is found impossible to extirpate it in its totality, without altering the continuity of the bone or bones of some important regions of the limbs. M. Hervez de Chegoïn (*Journ. Hebd. Univers.*, t. II., p. 117) has clearly established, that extirpation, or amputation, where practicable, is the only effectual remedy—for example: for sanguineous fungoid tumors, made up of heterogeneous tissues and encephaloid matters, and when they have reached to a certain depth in the organ—except that we must take care not to confound them with simple erectile tumors, which at the present day are cured by much milder means. As to cancers, properly so called, it is not required that they should have penetrated to the bones before we proceed to amputation. If they are large and immovable, and go deeper than the integuments, and implicate the aponeuroses, muscles, vessels and nerves, we should compromise the life of the patient by attempting to preserve the limb. The greatest misfortune in all these cases is, that amputation itself is no certain security, always, against a return of the disease. A young man, in other respects in exceedingly good health, came to La Charité for an enormous fungus hæmatodes upon the calf of the leg. Through fear, I concluded to amputate at the femur; but the wound of the stump had not yet healed, when the disease had already invaded the remaining part of the thigh.

[At a meeting of the Pathological Society of London, May 2, 1854, Mr. Fergusson, in reporting a case of medullary cancer of the femur in which he had performed amputation through the bone, and not at the articulation, remarked, that he did not agree with the rule ordinarily laid down in such cases, to disarticulate the bone, as his experience had taught him that the medullary cavity is very rarely affected by extension of malignant deposit. (*Lond. Med. Times & Gazette*, May 1854, p. 556.) G. C. B.]

## § III.

Nor do *exostoses* and *fibrous* tumors, whether of the species elephantiasis or otherwise, unless they should be exceedingly voluminous, or should have compromised the general health and destroyed the natural functions of the part, or cannot be taken away separately and completely distinct from the bone, and from the neighboring organs most essential to the maintenance of life in the rest of the limb, absolutely require amputation.

§ IV.—*White Swellings.*

Numerous observations have shown that white swellings yield more frequently than had been generally imagined, to the resources of a judicious therapeutie, and that we should not, so long as the caries or supuration of the articular surfaces is not clearly established, have recourse to the removal of the limb, until we have exhausted upon the disease all the means that our judgment enables us to suggest. The phrase *white swelling* is, moreover, one of too vague an import, at the present day, to have any value as an indication of amputation, (Jeanselme, *Arch. Gén. de Méd.*, 1837.) It is upon the character of the disease and of the tissues affected, and not from the title of white swelling, that we are to make up our judgment upon the propriety of amputation in diseases of the joints. If the capsule has been for a long time filled with pus; if there are fistulas existing about the joints, and the friction made on the surfaces leave no doubt as to the extent of the necrosis or caries; if, also, the ligaments and surrounding fibrous layers are destroyed, and an ichorous fluid escapes in large quantities, and a fungoid or fatty degeneration has involved the synovial membrane and most of the soft tissues; if the limb be atrophied both above and below, and is luxated, or has a tendency to become so; if, in a word, it is manifest that the bones and the cartilages have been for a long time the seat of a deep-seated, destructive alteration in the parts; then is amputation indicated: though the cure, even where all this mischief exists, does sometimes ultimately take place in the articulations, especially in those of the fingers.

§ V.—*Suppuration.*

Unless suppuration should derive its source from some disease in the bones, it rarely happens, whether it be of long standing or recent, superficial or profound, or is ever so abundant that it renders amputation absolutely necessary. Regimen, judicious medication, incisions and suitable dressings, ought to be sufficient to dry up its source. In the contrary case, we should look for the cause in the general condition of the patient, or trace it to some internal lesion; in which case amputation would but hasten the progress of the disease. We admit the dangers of those suppurations which sometimes invade the greater portion of a limb, and are ordinarily the result of inflammation of the synovial capsules, the tendinous sheaths, or inter-muscular tissue; and every person has been enabled, on this head, to make observations similar to



those of Leeat, (*Propriétés des Nerfs*, p. 202.) But as these dangers are not always present, as death is not always their inevitable result, and as it is practicable to make successful resistance against or entirely to prevent them in a good number of cases, suppuration of the soft parts, without degeneration of the bones, ought not to be ranged among the indications for amputating the limbs. I have, moreover, had an opportunity of witnessing three patients on whom it was performed, and who sank as rapidly, or more so even, than they would have done had they not been operated upon. In the two first a suppuration, which numerous incisions had not been able to arrest, occupied almost the whole of the fore-arm; in the other, the evil, which did not approach so near the wrist, had reached to above the elbow. They were all amputated at the arm, and they died before the fifteenth day, with purulent deposites in the viscera. In fine, if the suppuration is purely local, and the destruction of the tissues slight, amputation is not indispensable; and should it be kept up by constitutional disease, it will not succeed.

#### § VI.

Corroding ulcers, lupus, and phagedenic sores, of the legs, which formerly constituted one of the principal indications for amputation, do not in reality require it, or do not exact it at least, but in a very small number of cases, as when the skin is destroyed and the muscles laid bare, to a great extent around most of the limb; nevertheless, it is proper that the patient should desire the operation, and that he should be convinced that there is no hope of curing him by any other mode.

#### § VII.

In *Tetanus*, for which M. Larrey, (*Clin. Chir.*, t. I., p. 27 a 131,) M. Del Signore (*Arch. Gén. de Méd.*, t. II., p. 298) and some others have had the courage to employ it, is it possible that any advantages could be derived from it? Would it not rather be aggravated than cured by the removal by the limb? I am aware that a man from the country was saved in this manner by Dubois, that Levesque-Lasourcee (*Bull. de la Fac. de Méd.*, 7e année, p. 100) has published a similar fact, and that we find here and there in periodical publications other examples of success obtained in the same manner. Nevertheless two of the patients operated upon by M. Larrey died notwithstanding the amputation, and the state of the third leaves the matter in doubt as to the real nature of his disease. If in itself the wound which has caused the tetanus should be of so serious a nature as to justify an extreme measure, the access of this frightful disease would without doubt weigh in the balance as a determining motive. But in other cases I should be so much the less disposed to follow the example of our celebrated military surgeon, inasmuch as amputation is, as is known, in itself a potent cause of the very disease for which it is here proposed to employ it as a remedy.

[*Amputation for Tetanus*.—As illustrative of this subject the following facts may be useful:—

Sir Geo. Ballingall (*Outlines of Military Surgery*, Edinburgh, 1844)

gives an important fact which he derived from Deputy Inspector Marshall, to show that the statements touching the *production of tetanus* by *punctured* wounds have been greatly exaggerated. Out of one hundred cases of *arrow* wounds at Ceylon, (East Indies,) Mr. Marshall did not, even in the heat of that climate, which as we see in all tropical countries, constantly predisposes in all diseases to complications of tetanus, trismus, spasms, convulsions, &c., meet with a single case of tetanus!

Dr. Casper of Berlin (vid. Casper's *Wochenschrift*—also *Journ. des Connaissances*, &c., Paris, Aout, 1844, p. 74) relates the case of a man aged 35, who having had a corn removed from the little toe of the left foot by too deep an incision, continued notwithstanding the pain which ensued to do his duty as a domestic where he was employed, until he had to take to his bed. M. Casper found the patient complaining of no other symptom than the pain in the part from whence the corn had been extracted, and in place of it a vesicle filled with blood, the foot also being swollen throughout its whole extent. In a day or two came on difficulty of swallowing, stammering, and difficulty of articulation, though preserving all his mental consciousness perfectly. Tetanus followed with death the same evening. Pus was found effused under the integuments, and the mucous bursa over the articulation was filled with blood; but no lesion was discovered on the branches of the fibular nerve which are distributed to the toes.

Dr. Aberle (*Jour. des Conn. Méd. Chir.*, Paris, Nov., 1844, p. 208) relates an instructive case in which it finally became necessary to amputate the medius finger for a wound from a splinter (*écharde*) under the nail, which the patient, a female aged 22, had supposed she had extracted. The paroxysms of tetanus which had continued daily for weeks, and which were kept under and ultimately reduced to one a week by repeated small enemata of equal parts of spirits of turpentine, olive oil, and mucilage of gum arabic finally returned with all their force and induced the patient to consent to the operation. Immediate relief was obtained, but to the dismay of all it was found that though the wound on the point of the finger had *cicatized* a portion of the splinter (*écharde*) was found buried in the nerve! The patient recovered completely.

Mr. Miller, Professor of Surgery in the University of Edinburgh, in a case of traumatic tetanus (*Cormack's Lond. and Edinb. Monthly Jour. of Med. Sc.*, Jan., 1845, p. 22, &c.) in a girl aged 7, from injury to the right middle finger caused by a cart wheel passing over it, and in which case unequivocal tetanic symptoms developed themselves on the 20th day after the accident, in trismus and pain of the jaws, opisthotonos, rigidity of the upper extremities and abnormal muscles, immediately on the day of their appearance performed amputation at the metatarso-digital articulation. The case was then treated with large doses of the *cannabis Indica*, (Indian hemp,) sometimes to 30 drops of the tincture (equivalent to three grains of the resinous extract) every half hour, together with bags of cold ice to the upper part of the spine. He places much reliance on Indian hemp, as from his experience in this case its extraordinary anti-spasmodic and *narcotic* effects, though it may be comparatively useless as an *anodyne* in ordinary cases of

disease, are wholly exempted from the objections to opium, morphine, aconite, &c. For instead of constipating the bowels it creates an inordinate appetite, (especially in convalescence,) which enabled the Professor during the treatment, which however was prolonged to two months before the tetanus was subdued, to administer constantly a supply of wholesome nourishment (strong beef tea) to replenish the exhausted excitability necessarily caused by such severe and morbid exercise of the muscular power of the whole system of voluntary muscles. He recommends also careful attention to evacuation of the bowels, but above all early amputation of the injured part upon its cardiac aspect. To show the power of the cannabis Indica in controlling muscular spasm, and the *extent also to which morbid muscular power is developed* in tetanus, it may be remarked that large as the doses were on this young and slender girl, none of its unpleasant effects were produced. Dr. O'Shaughnessy, from what he saw of the virtues of the Indian hemp in India in tetanus, was induced to commend it strongly to the notice of British practitioners, (See *British and Foreign Medical Review*, July, 1840, p. 225,) and it is worthy of further trials after those of Mr. Miller given above, as a valuable adjunct to early amputation—instead of the disturbing herculean doses of opium, wine, alcohol, &c., formerly in vogue in tetanic affections, especially in traumatic tetanus. T.]

## § XII.

*The bite of rabid animals* is also, in the estimation of some, a case for amputation. M. Calloway (*Clinique des Hôpitaux*, t. I., p. 16) had no qualms about taking off in this manner the arm of a person who had been bitten in the hand, and who, by the way, died nevertheless of hydrophobia in eight hours after. At farthest we should never think of it, except for a finger for example, unless the wounds are so extensive, complicated and deep that we cannot cauterise or in any other manner excise their whole track; the amputation also should in such cases be performed immediately, as in a lady whose case was transmitted to me by M. Champion; for after the absorption of the virus has once taken place, how can it be of any utility?

## ARTICLE VI.—AMPUTATIONS OF EXPEDIENCY.

Anchylolysis, complete or incomplete, deformities of different sorts, ancient ulcers that are incurable, or where the cure is not permanent, or any annoying condition whatever of certain parts of the limbs, often induce patients to demand relief from them at whatever sacrifice, though their life and general health are not in any manner endangered.

As a general rule, a discreet physician ought, in such cases, to resist the entreaties of persons who consult him. There is evidence, in fact, to show that the operations which are denominated those of complaisance terminate sufficiently often in an unfortunate way. In 1821, there was received into the Hospital of St. Louis, a man of robust make, in the vigor of age, and in other respects enjoying the most flourishing health, but with the firm resolution of having his thigh cut off for an anchylolysis of the knee, which obliged him to use a crutch. After having remon-



strated with him in every possible way, and traced out to him as black a prospect as could be portrayed of the dangers to which he would be exposed, M. Richerand finally acceded to his entreaties; the amputation was one of the most simple; no local accident supervened; but an ataxic fever, which soon supervened, ended, nevertheless, in death on the fifth day. Pelletan cites a similar fact. I saw some quite as striking at the Hospital of Tours, from 1815 to 1820, and M. Gouraud, then surgeon-in-chief of that establishment, finally came to the resolution, as Dupuytren did afterwards, of giving a flat denial to these pressing requests of patients. In 1825, a countryman who had been an old soldier, annoyed at having a large leg, and carrying a dry ulcer behind the malleolus, presented himself in the wards of the School of Medicine with the idea of having his limb amputated. It was in vain that M. Roux endeavored to alarm him, and to make him feel the rashness of his project; nothing could shake him. The operation presented nothing peculiar; the first days went off as well as could possibly be desired; but constitutional symptoms supervened, and the man died at the end of the week.

What is worse, amputations of the least importance in themselves, those of a finger or toe for example, have not unfrequently been followed by similar results.

In 1829, there was received in the Hospital of St. Antoine, a shoemaker whose left fore-finger had been for a long time held firmly and immoveably fixed upon the palm of the hand. I operated upon him, and this patient, who did very well at first, and finally recovered, was, during fifteen days, so severely affected, that on two different occasions I thought there was no hope for him. A young peasant girl came into La Charité to have an amputation of her left fore-finger, which was retracted backwards, and adherent to the dorsum of the metacarpal bone; she died of phlebitis and of purulent peritonitis on the eighth day after the operation!

Nothing is more common than examples of this kind, and there is no practitioner who has not had occasion to see them. From thence has arisen a question among modern observers which the ancients seem never to have thought of: ought a practitioner to limit himself to simple explanations? Is it not his duty positively to refuse to perform operations which are not indispensable? At Paris, many surgeons have answered negatively, and violently oppose those who amputate under such circumstances. For myself, I find the question badly stated, and here is another one which may be brought into consideration. Does humanity allow that we should condemn a man to carry forever an infirmity which renders life a burden, merely because that in the attempt to get relieved of it, he may be exposed to more or less serious dangers? If that were the case, we should never interfere with lupus, nor tumors of any kind which are developed upon different points of the body; for they are rarely dangerous in themselves, and the operations we are obliged to employ to remove them may give rise to formidable accidents, or even cause death.

Far be it from me to justify those who are in haste to perform amputation of the limbs for lesions which do not absolutely require it, and for simple annoyances, and merely because the patients wish to be re-

lieved of them ; but I would ask if it be not conformable to a sound surgery to have recourse to it for deformities which we cannot otherwise get rid of, when those deformities are of a character to destroy the natural uses of an important part of the body, to give rise to pains, and to make them a source of trouble and continual suffering, and when the patient also has decided upon it, and maturely reflected upon the consequences which may result from his determination ?

Dominique de Vic, (Governor of Amiens,) (*Essais Historiques sur Paris*, par Sainte-Foix, t. V., p. 108,) in 1586, having had the fleshy portion of his leg carried away, and being thus incapacitated, from mounting his horse without experiencing the most acute pains, went into retirement for three years. Hearing that Henry IV. required the services of all his subjects, he caused his leg to be amputated, sold a part of his property, went to find his prince, and rendered him signal services at the battle of Ivry, and on many other occasions. Can he be blamed ?

A captain of marine having lost his foot, had the leg cut off near the knee, because, says Paré, (*Œuv. complèt.*, liv. XII, chap. 29,) he found it too long. Villars, as cited by Briot, (*Hist. de la Chir. Milit.*, p. 185,) did the same. Ought Sabatier to cast reproaches upon these practitioners, he who so long felt the embarrassment of too long a stump to the leg ? I would not like Odier (*Man. de Méd. Prat.*, p. 362,) go to the extent of amputating the fore-arm for a simple neuroma, nor for an ankylosis of the wrist, which caused no pain, nor for a false articulation, unless under circumstances altogether peculiar ; but I should decide in favor of it in the following cases.

## § II.—*Ankylosed Fingers.*

Whether deformed, flexed or extended, straight or deviated, an ankylosed finger is not only a useless organ, but a perpetual source of trouble, pain and accidents. If there be no other remedy, amputation is allowable. I have performed it seventeen times, and of these, fifteen of the cases were cured.

## § II.—*Supernumerary Fingers.*

Without being as annoying as those that are ankylosed, supernumerary fingers are enough so to justify their removal. I have amputated them on the thumb and little finger, and the little toe, and have had no reason to regret doing so. I saw—it is now twenty-four years since—a child of four days old, who had seven fingers on each hand ; the thumb and little finger were double ; I amputated them successively, and united by first intention. In 1837, I amputated, writes M. Champion, the two great toes that were double upon the child of the preceding case, and I separated apart the middle and ring fingers, which had been united at their two sides. In conclusion, I do not know what remark to make of the case of a double thumb, in a child of 3 years, amputated at the joint by Ch. White, and which was reproduced to the extent of causing W. Bromfield to amputate it a second time, which, however, did not prevent its reproduction again !

### § III.—*Prominent or angulated toes.*

Whatever may be the deviation of any one of the three middle toes, it is rare if they are at all prominent that the person does not experience pains, and an extreme degree of annoyance in walking or wearing shoes. In such cases, should the patients demand it, I amputate. I have performed it on five persons, two of whom were students of medicine, and although in one of these it was followed by some accidents, they all got well.

### § IV.—*Ankylosis of the Large Joints.*

So long as there is a chance of curing ankylosis, of assuaging the pains, or of putting the patient in a condition to walk, though it should be with crutches, I decline an amputation of the limbs properly so called; otherwise I am governed by circumstances. A man from Provence who, in consequence of successive inflammation of the joints, had the hips, knees and feet ankylosed with the legs and thighs bent into a serpentine direction, so as to be unable to stand erect, or to seat himself, or lie upon his side, obliging him thus to pass his life upon his back, sought in vain at Lyon, Nîmes, Avignon and Toulouse for a surgeon who would amputate his two thighs, and then came to Paris with the hope of attaining his object. I, like the others, at first refused. "Though a cripple, I might then, said he to me, be enabled to occupy myself and live. But as I now am I do not exist. Amputation you say might kill me; that is not so certain. Besides I suffer, and I do not wish to live if I am to remain as you see me. Therefore I leave here either my legs or my body!" The two amputations were attended with complete success, and he returned as happy as a god!

[The following curious case is deserving of a place in connection with that related by our author. It was published in the *New-York Journal of Medicine*, May, 1853.

The case related by Dr Purple, is that of a young man, a native of Virginia, who, at 22 years of age, had his back broken by the fall of a tree, which he was in the act of felling. The result of the accident was the immediate loss of motion and sensibility in all parts below the fifth dorsal vertebra, and of voluntary power over the bladder and rectum. He recovered, however, from the immediate effects of the accident, and regained a fair amount of his former health, but the paralysis continued, though the paralyzed parts were as plump and warm as ever. He gained his livelihood as a pedlar, and spent nearly all his time lying on his back in the vehicle in which he travelled from one place to another.

In 1851, six years after the injury, he presented himself to our County Medical Society, and requested the amputation of his lower extremities. He insisted upon its performance with his wonted resolution and energy. His reasons were, that they were a burdensome appendage to his body—causing him much labor to move them, and that he wanted the room they occupied in his carriage for books and other articles for peddling. These reasons were not sufficient to induce a majority to consent to an amputation, as, independent of the horrors of so



extensive a mutilation for such reasons, there were fears that the vitality of the vegetative existence enjoyed by these limbs was such as might endanger a healthy healing process.

The patient, nothing daunted by our reasoning, firmly resolved to cast off the offensive limbs as a useless burden on the rest of his body, sought other counsel, and succeeded in getting his wishes gratified. Both limbs were amputated near the hip joint *without the slightest pain, or even the tremor of a muscle*. The stumps healed readily, and no unfavorable symptoms occurred in the progress of a perfect union by the first intention. In this mutilated condition he was unable to move his pelvis in the slightest manner without the greatest effort by the aid of his hands.

He then resumed his former wandering life, and travelled over this and portions of the adjoining States, until May, 1852, when he was arrested in this village by his last disease, which suddenly terminated his life.

He died with all the symptoms of the disease of the digestive functions consequent upon his bacchanalian propensities, to which he had been strongly addicted since the injury. He was very excitable, and the smallest quantity of spirits irritated the brain to the utmost frenzy. His irritable characteristics were unbounded, and although he was in the most helpless condition, he was converted from a man of a mild and amiable disposition to one of the most irritable of the human family. His energy, his force of character, and his mental powers, generally were very much increased by the narrow limits in which his sentient powers were confined.

Mr. James, of Exeter, in his valuable paper *On the Causes of Mortality after Amputation of the limbs*, Part II.; in the *Trans. Prov. Med. & Surg. Association*, Vol. XVIII, p. 330, thus expresses his opinion on amputation for useless limbs: "My own record contains but few cases of the kind, none of which appear to have proved fatal; and I am much inclined to think, from the present examination and a careful consideration of the subject, that little risk is incurred. The limbs are wasted; there is no active disease. The time, the season, and the place may be selected, and in all these respects such operations stand apart from many others. He there gives a summary of 11 cases in which he has operated; these were as follows:—Thigh, 7; Leg, 3; Arm, 1; Total, 11; and all successful. G. C. B.]

#### § V.—*Ulcers with Loss of Substance.*

In consequence of extensive burns, gangrene, phlegmonous erysipelas, or old ulcers, it may happen that the integuments throughout the whole circumference of a limb are destroyed, together with the aponeurosis and some of the muscles, to such extent as to render cicatrization forever impossible. If the patient desires it, amputation is applicable here also; but in all such cases I wait for the patient himself if he is an adult and has his reason, or in the contrary case for his parents, to demand the operation. I do not decide upon it but at their entreaties, and after having pointed out to them all its dangers and chances.

## CHAPTER II.

## PRELIMINARY CAUTIONS.—

## ARTICLE I.—COUNTER-INDICATIONS.

Before amputation is performed it is not only necessary that the disease which requires it should be one that cannot be cured in any other manner, but also that we be enabled to remove the whole of the disease, and with a rational prospect of saving the life of the patient, (Malle, *Contre-Ind. aux Opér.*, Strasb., 1836.)

## § I.

When the disease is a *cancerous* affection, it is important to make ourselves assured that there exists no germ of it in the viscera. If a diseased condition of the lymphatic glands is observable at the upper part of the limbs, and that the color of the skin, the state of the respiration and digestion, or any other symptom whatever indicates that the disease is not confined to the surface, amputation is useless and would only serve to hasten the development of lesions analogous to those we desire to relieve.

## § II.

*Pulmonary phthisis, necrosis* (Mehée, *Plaies d' Armes-d-Feu, etc.*) *caries of the vertebral column*, (Lassus, *Fract. de Pott*, p. 181, 1788,) abscesses from congestion, any organic lesion of the heart, liver, stomach, or genito-urinary passages, &c., extreme prostration, intestinal ulcerations in considerable numbers and of long standing, coincident or not with a colliquative diarrhœa, are, unless in a case of urgency, (see Vol. I. of this work,) so many positive counter-indications, (Dela-touche, *Dissert sur l' Amputation*, Strasbourg, 1814.) In fine, in all cases where in the removal of a limb we leave in the organization a disease of such gravity that death will almost inevitably follow, we ought to abstain from the operation. When it is for a scrofulous, syphilitic or rheumatic affection, we have to apprehend that it will soon be reproduced in other parts of the limbs, and may oblige us, if we propose to follow it up, to perform successively a number of amputations. We ought, therefore, in such cases to have at least a strong reasonable prospect of being enabled to limit the progress of the general disease, in fact to retard its advancement and ultimately to extirpate it effectually. Prudence, for example, does not permit us to amputate a limb affected with rheumatic or *syphilitic* caries or necrosis, if other parts and some of the articulations are already the seat of swellings, pains, and other primary symptoms of a similar affection.

[When tubercular disease of the lungs coincides, as is frequently the case, with that of a joint, amputation is generally regarded as an unjustifiable operation. The diseased joint in these cases is supposed to act as a safety valve, warding off or keeping in check the internal affection.

But, as Sir Benjamin Brodie remarks in the last edition of his work "*On the Diseases of the Bones and Joints*," visceral disease, which was previously in a state of inactivity, may assume a new form, and make rapid progress under the depressing influence of the articular malady, and under these circumstances an amputation may prolong life, perhaps for several years. He relates a case in point. A young woman, affected with strumous disease of the joint, had also a troublesome cough, purulent expectoration, &c. on which account Sir Benjamin did not deem an operation advisable. As the pain became insupportable, the patient earnestly implored him to amputate the limb, to which he finally consented with reluctance. The stumps healed readily; the pulmonary symptoms soon subsided, and four or five years afterwards she was in good health. M. Nelaton, in his *Elemens de Pathologie Chirurgicale*," tom. II. p. 227.) refers to a case in which M. Velpeau amputated, notwithstanding M. Andral and several other physicians had diagnosed tubercular disease of the lungs. Two years afterwards the patient was in the most perfect health. The testimony of Mr. James, of Exeter, is to the same effect. G. C. B.]

### § III.

In regard to *scrofula*, however, it had been for a long time noticed that the removal of an important part from the body was often followed by a favorable change in the general health of the patient; that after the cure debility has been succeeded by manifestations of strength, and of the most flourishing health. This is a change which we may readily comprehend: an abundant suppuration, protracted pains, and a disorganized condition of the articulations, constitute a morbid cause calculated continually to impair the functions, and cannot fail of keeping up in the economy a sufficient degree of disturbance to impede the developement of the natural resources of the system. In removing, therefore, this real cause of suffering and danger, it is very natural that the health should afterwards be re-established; that nature ceasing to be disturbed and embarrassed in her efforts, should then be enabled to suppress less serious lesions, and to preponderate over a morbid process whose principal source has been destroyed.

### § IV.

One of the first questions to decide is to know if there are really any internal diseases existing, and to ascertain their nature, for if these be incurable amputation is inadmissible. The next question is to determine the source of the mischief, for if this be external then amputation is formally indicated, but if elsewhere, the contrary. As often as a local affection is the result of general disease, we must entirely subdue this latter before thinking of removing the former, which, according to correct practice, does not allow of amputation until it becomes reduced to what exists of it externally. A minute examination of the patient before coming to a final decision, is so much the more important, inasmuch as most of the diseases which require amputation rarely fail of producing a reaction to a greater or less degree upon the internal organs,



and of thus giving origin in the viscera to abscesses, tubercles, ulcerations, indurations, and numerous other morbid determinations, whose exact appreciation or detection is far from being always an easy matter.

### § V.

It is well nevertheless to remark that the debility which is found to exist in certain patients, is not in itself an absolute counter-indication to the operation. All observers know that it is not in the strongest subjects, and those who have the greatest appearance of health, that amputations succeed best. A certain degree of exhaustion produced by protracted pain, even diarrhœa itself when it is not kept up by any internal organic lesion, are in general favorable rather than unfavorable conditions. It would seem that in the first case the organization in possession of its whole forces, revolts at the mutilation which it has suffered; while in the other, the affection upon which it had exhausted all its resources, being removed, it has no other task to perform but to dissipate the subsequent disorders which it was not in its power to prevent.

### § VI.

When we have under consideration *recent traumatic lesions*, there may be a number of serious wounds in the same patient. Ought we then to amputate? and if there are several limbs to be removed, should all this be done on the same day? Bagieu relates that in a man who had both legs crushed, it was decided upon to remove the one most injured first; but that by mistake the other was taken off and the bad one got well! I amputated the leg of a man who had just fallen from a second story. He died on the fourth day with a laceration of the liver. In another case of wound it was proposed to amputate both legs; I objected to it. After death it was found he had twelve ribs and six of the vertebræ fractured! If the two hands or two feet are the only parts wounded, we may amputate them immediately. Though the accompanying wounds are not in themselves mortal, still we should amputate. If other parts seem too seriously compromised, then wait and do not amputate immediately.

### ARTICLE II.—THE PERIOD TO AMPUTATE.

In the last century surgeons were zealously occupied with the question whether after severe wounds by fire-arms or otherwise, it was better to operate immediately or to wait for the constitutional reaction. Faure, (*Prix de l'Acad.*, t. II., p. 337, et *Mém. de l'Acad. de Chirurgie*, t. II., p. 323, 1819,) Boucher, (*Mém. de l'Acad. de Chir.*, t. II., p. 199, 1819,) Bilguer, (*Abus de l'Amputation des Membres*, &c., traduit par Tissot,) Leconte, (*Prix de l'Acad. Roy. de Chir.*, t. III., p. 357—367,) Schmucker, (*Richter, Biblioth. Chir.*, t. IV., p. 1,) and De la Martinière (*Mém. de l'Acad. de Chir.*, t. IV., p. 133) particularly discussed this question during the controversies that took place. And although almost every surgeon since that period has treated of it, no one has yet been enabled to come to an absolute decision.

## § I.

The partisans of immediate amputation, among whom we must reckon Van Gescher, (*Necessité de l'Amputat.*, &c., 1767, in Dutch,) Fabre, (*Differents Points de Physiol.*, p. 279,) Briot, (*Prog. de la Chir. Milit.*, p. 189,) M. Durand, (*Thèse No. 198, Paris, 1814*,) M. Jacquin, (*Thèse No. 54, Montpellier, 1831*,) and M. O. Gouraud, (*Demonstr. des Princip. Opérat.*, 1815,) maintain that immediately after the wound the patient is found in the most favorable conditions possible. There is then, say they, no fever, suppuration or inflammation; the affection is entirely local; while at a later period the swelling of the limb, often gangrene, a violent reaction, tetanus, and a thousand other accidents may cause death before we have the opportunity to amputate. Even though this primary reaction may be calmed, the copious suppuration, and the separations of the muscles and the fistulous passages which may have been established together with the induration and disorganization of the tissues, ordinarily render the operation of a more serious character.

## § II.

To sustain their position, the partisans of *consecutive amputation*, among whom are to be ranged, Mehée, (*Inutilité de l'Amputat. des Membres*, Paris, 1800,) Lassus, (*Trad. du Traité des Fract.*, de Pott, p. 181,) M. Delatouche, (*Amputat. dans les Cas de Fract.*, etc., Strasbourg, 1814,) and Leveillé, (*Soc. Méd. d'Emul.*, t. V., p. 192,) maintain, on the contrary, that in the first moments the organism is too intensely disturbed, and under the control of a commotion too violent to admit of the possibility of success from any operation whatever, and above all that we run the risk of sacrificing limbs which it would have been easy to have preserved; whilst after having combated the first symptoms, should amputation become necessary, we have at least nothing to reproach ourselves with.

Besides that the question under this form is misplaced, the two opinions, taken literally, appear to be equally remote from sound practice. When amputation becomes absolutely indispensable, there is no doubt that it is better to perform it promptly than to put it off, and Faure, himself, (*Prix de l'Acad. de Chir.*, t. III., p. 337, edit. 1819,) who defends with so much zeal the cause of consecutive amputations, does not take opposite ground to this opinion. Bagieu (*Exam. de plus. Quest. de Chir.*, t. I., p. 137, 12mo.) and Leveillé have in this respect gone much farther than him. On the contrary when there is any chance of saving the limb, and its destruction is not inevitable, we may temporize and resist the general symptoms, reserving our decision to amputate, after the reaction is subdued, to those cases only in which we cannot obtain a cure by any other means.

## § III.

On examining the subject more closely, it is also evident that Faure has not treated the question in a proper point of view. It is true that

his ten cases of wounds all of them had fracture; the first, the ninth and tenth, in the leg; the second in the thigh; the third in the knee; the fourth and fifth in the fore-arm; the sixth in the humerus; the seventh in the metacarpus; and the eighth in the heel; but the wound from the fire-arms was not sufficiently serious in any of them to extinguish all hope of saving the part. In regard to these cases the difficulty was to know whether amputation was indispensable, and not whether it should be performed at an earlier or later period. The result about which this surgeon made so much noise, does not therefore in any manner prove that amputation, when once admitted to be necessary, is less dangerous after than before the access of the general symptoms. We may, in fact, deduce from it a totally opposite conclusion. What, in truth, did he gain by thus temporizing? Nine out of his ten patients were reduced to the necessity of losing a limb, and that after five or six weeks of severe suffering, and running the greatest danger of losing their lives. To say that if they had been amputated immediately they would not have recovered is altogether a gratuitous assumption. Reason, on the contrary, shows that these men who had such strength to resist so many causes of death, would have been much better cured if they had been operated upon at the beginning, and their recovery would probably have been completed, when, by the method of Faure, they were still under the anticipation of the operation.

#### § IV.

In admitting that secondary operations succeed better than immediate, the Academy of Surgery have evidently been deceived. Against the calculations of Faure, which maintain that the success is in proportion of three to one, we may at the present time oppose the experience of a multitude of reputable persons, who have observed directly the reverse. Dubor (*Thèse*, Strasb., 1803. Larrey, *Clin. Chir.*, t. III., p. 518) affirms, that in the American war, the French surgeons, by deferring amputations, lost almost all their patients, while the Americans, by amputating immediately, saved almost all theirs, without scarcely an exception. In the affair at Newbourg, Percy (Gouraud, *Oper. cit.*, p. 8) performed ninety-two immediate amputations, and cured eighty-six of them. M. Larrey (*Ibid.*, p. 8) cured twelve out of fourteen. Out of sixty wounded in the naval action of Jan. 1, 1794, and who were amputated immediately, two only died, (Fercoc, *Lettre à M. Larrey, Clin. Chir.*, t. III., p. 515.) After the battle of Aboukir, the eleven soldiers mentioned by Masclet, (*Lettre à M. Larrey, Clin. Chir.*, t. III., p. 517,) who were amputated in the first twenty-four hours, got well, while three others amputated eight days after, died. The English surgeons assert, that after the battle of Toulouse immediate amputation succeeded in thirty-seven cases out of forty-eight; while in those in whom the amputation was deferred, twenty-one died out of fifty-one. At the attack upon New Orleans, the proportions were still more favorable, for out of forty-five amputations of the first kind, seven only perished, while out of seven of the second, two only were cured. We learn also that after the battle of Navarino, out of thirty-one immediate amputations, M. del Signore (*Archiv. Gén. de Méd.*, t. XXI., p. 298) lost but one;



while out of the thirty-eight that he amputated in the twelve following days, he saved but twenty-five.

### § V.

Finally, the events of 1830 enabled us to corroborate the same facts at Paris. One hundred amputations were performed, thirty-four at the Hôtel Dieu, fifteen at La Charité, twenty at Gros Caillou, thirteen at Beaujon, six or seven at St. Louis, four or five at the Maison de Santé, three at the Necker, one at the Hospital of the School of Medicine, one at St. Méry, and five at La Pitié, and in all these places it was observed that immediate was more successful than consecutive amputation. Almost all of the first kind succeeded, while a great majority of the other kind had a fatal issue. The service of M. Roux, the wards of M. Larrey, of M. Richerand, M. Marjolin, and Dupuytren, gave proof of this assertion, though with the last the difference was less marked. The two cases also at La Pitié, in whom I deferred the amputation, died. Nevertheless Sommé, who after the battle of Antwerp, performed five immediate and three consecutive amputations, lost two of the first and saved the three last; but what a difference was there also in the gravity of the wounds! In Holland, M. Kerst, who has decided for consecutive amputation, because of sixteen amputated in the first twenty-four hours, eight died, while of twenty amputated after fifteen to twenty days, four alone perished—and who admits no other cause of the difference of result in these two series than that of the period at which the amputation was performed—finds a sturdy antagonist in M. V. Onsenort, who, though a countryman of M. Kerst, gives the preference to immediate amputation.

Though secondary amputation should even succeed as often as it fails, it would be no reason for giving it the preference; it would be required, moreover, (and which is not the fact,) that immediate amputation, in itself, should offer fewer chances of success. The fundamental argument of the partisans of temporization, to wit, that a multitude of mutilated persons would have been enabled to save their limbs, if the surgeon had delayed, is, as I have already said, more specious than solid; for we can reply to them, that a goodly number of the other cases would be *living with three limbs*, if, in delaying the operation, they had not *suffered them to die with four*.

### § VI.

Though experience had not spoken, who could be made to believe that a simple, regular, and smooth wound, could be more dangerous than those wounds from fire-arms which, accompanied with fracture of the bones and crushing of the soft parts, require amputation? The pain, too, of the operation, can that be weighed in the balance along with those that patients, not amputated, every day suffer, and which are reproduced upon the slightest movements, or from examinations of the wound, dilatations, and the numerous incisions we are obliged to make to extract the splinters, moderate the inflammation, or give egress to the morbid discharges? In fine, who would have the temerity

to maintain that, in this last condition, the wounded patient is not a thousand times more exposed to phlebitis, purulent infection, tetanus, and all the different kinds of visceral inflammation, than if an amputating wound had been substituted for the serious lesions he was suffering under?

And, after all, it is not at the present day that the doctrine of immediate amputation has been promulgated. Surgeons like Lecomte, Thompson, Hennen, MM. Larrey, Gouraud, and Guthrie, in opposing the ideas of Bilguer, Faure, Hunter, Percy, Lombard, and Leveillé, have done nothing more than to confirm or to establish, beyond the possibility of dispute, the justice of the assertions of Duchesne, who wrote at Paris in 1625, and also those of Wiseman, Le Dran, &c.

The advantages of this practice being now undoubted, the only question is to know at the very first whether an amputation is or is not necessary; which excludes it then from the category of the diagnosis or indications? It is from having been constantly wandering from this point, that the question has remained so long undecided, and that it so frequently becomes the subject of controversy.

## § VII.

Upon the whole, therefore, amputation should be performed immediately; that is, in the first 24 hours, and before symptoms of reaction have commenced; in a word, as soon as possible, so long as there is no other chance of curing the patient. The stupor and insensibility which are observable in some cases of wounds, is not by any means a positive counter-indication. A Swiss, whom I saw at the Hospice de Perfectionnement, July 27, 1830, with the thigh shattered from a ball, and who I advised should not be operated upon, was amputated by M. P. Guersent, and did exceedingly well. We are not to abandon any cases but those that seem to be without any resource. It is for the skilful surgeon to decide what are the accidents which require delay. In doubtful cases, we defer; but if afterwards amputation becomes indispensable, we should be aware of the fact that it scarcely ever succeeds if performed during the severity of the symptoms, when the affection is not completely localized, and signs of phlebitis or infection have made their appearance. It is then especially that the viscera and all the functions should be thoroughly examined, seeing that the reaction which we had hoped to have had it in our power to subdue, often leaves in the system purulent depositions which would be certain to endanger the success of the operation. These various remarks are as much applicable also to amputations rendered necessary by causes other than those of fire-arms, as to those of which we have been speaking.

[*When to Amputate.*—Sir George Ballingall (*Outlines of Military Surgery*, Edinburgh, 1844, p. 337) makes a remark of great value, which, though it appertains more exclusively to military surgery, has now (in the present frequent and dangerous use of fire-arms in our own country, on all occasions, civil as well as military, as in street-fights, broils, &c.) become of every day practical value, though apparently hitherto overlooked. It is the well-established fact that, in gun-shot wounds from balls, there is generally an *extensive comminution and*

*splintering of the bone*, which is split and shivered, cracked and fractured, in all directions—chiefly, however, longitudinally, and not unfrequently to the distance of six inches, as in the tibia, &c. Numerous specimens of these are in possession of Sir George Ballingall, and he deduces from it the rule in practice, that full allowance should always be made, in cases of this kind, for the extent of this comminution, when about to amputate or exsect, or where the joints are laid open. The comminution, and also the calibre of the aperture, as is well known, are always greatest at the place where the ball makes its exit, (Ib.)

This Surgeon, also, presents some rather new, and certainly important, rules, as gathered from his great experience, both in military and civil hospitals, in relation to the *time* when amputations should be performed. He is satisfied that, in civil hospitals, *primary* amputations, *i. e.*, those that are performed at once and before reaction has commenced, do not do so well as in military hospitals; and the distinction he makes, founded on the different action of the moral causes in these two different states of circumstances, seems to us perfectly just. Thus, the soldier is ordinarily of far more robust health, and not only comes perhaps out of a filthy barrack-room into a clean, airy, well-regulated and uncrowded hospital, which thus improves his tone of health and increases his chances of cure, but has his mind at rest also as to his situation after amputation, as he knows a pension is then provided for him. Different is the condition of the labourer, for example, from the country, who, from a perfectly pure air, immediately experiences the deteriorating influence upon his health, on entering a civil hospital in a city, (as is remarked also by our author, M. Velpeau, *sec vol. I., supra*,) and as is familiarly known, however clean and well-regulated the hospital may be, is almost always attacked under this change of his customary food, air, &c., with a species of febricula or, perchance, fever, which Sir G. Ballingall appropriately denominates a *seasoning*, and which he says, notwithstanding the reaction which is superadded to this by the amputation itself, should not deter us, in most cases, from proceeding at once to the operation, and thus take our chances for a favorable result from this combination of the *symptomatic* and *house fever* together. But few surgeons, however, would venture to go so far. Dr. Cormack (*Lond. & Edinb. Month. Journ.*, Dec. 1844, p. 1046) thinks the patient should be allowed first to go through his seasoning fever, especially if there has been a *rigor*.

As to what are called *intermediary* amputations, in contra-distinction to primary and secondary, *i. e.*, those during the existence of the constitutional reaction, they are *compulsory*, and not the time of choice which any surgeon would prefer.

*Secondary* amputations, however, or those performed after the inflammatory and febrile action have subsided, and when suppuration has commenced, are, as is well known and as has been fully discussed in the text of our author, (M. Velpeau,) always preferred, by some surgeons, to those that are called primary.

Sir G. Ballingall thinks the relative proportion of deaths and successes, from both primary and secondary amputations, and an accurate statistic also of the co-operating influences, such as those of the air,



climate, constitution, the moral effect of victory or defeat upon an army, &c., would throw valuable light upon this subject. T.]

ARTICLE III.—OF THE PLACE WHERE THE AMPUTATION SHOULD BE PERFORMED.

All amputations have been divided into two great classes: those that are performed on the body of the limbs, take the name of amputations in *continuity*, the others are nothing more than *disarticulations*, and are distinguished by the title of amputations in *contiguity*. Amputations, moreover, are performed in a place of *election*, or one of *necessity*, according as the practitioner is free or forced by the disease to act on one point rather than another. Upon this subject we can scarcely lay down other than extremely uncertain rules, for there are none of them that are not liable to numerous exceptions. Thus, it is not always correct to maintain that we ought to perform as far from the trunk, and remove as little of the parts, as possible; or that we should make choice of the place that is smallest, and is the least bulky.

§ I.

It is the same with the rule which prescribes, that we should always amputate *above the diseased tissues*. Fatty degeneration by no means exacts the removal of the parts involved in it, since it may be of some advantage to preserve them; being the usual result of an alteration in hard parts, this as well as the fistulous passages and the purulent tracks, disappear as soon as the cause has been removed. It is sufficient, in such cases, to make the section of the bone above the part where this itself has undergone an alteration, without being at all disquieted by the state of the soft parts, especially if the case under treatment be the thigh or the upper extremity.

§ II.

On this subject, the *nature* of the disease is to be considered as well as its seat. If the question be that of immediate amputation in consequence of shattering or extensive damage to the limbs, or wounds from fire-arms, or gangrene, inflammation, and suppuration still advancing, or cancerous tumors, the instrument should be carried as high up above the apparent seat of the evil as the importance of the organ will allow. If, on the contrary, the disease which requires amputation is a gangrene defined, a necrosis, caries, suppuration, fracture, compound dislocation, wound of an artery, a division from a cutting instrument, or a strangulation, and that the morbid process which has resulted from it, is purely local, and has no disposition to extend higher up, we may, without any impropriety, take away that part only which has been actually disorganized.

§ III.

After *traumatic lesions*, it is generally advised to amputate at the

articulation, or in the continuity of the bone above it; the accidents which, under such circumstances, supervene after amputation, being most usually imputable to the fissures which extend sometimes to the spongy texture of the upper articular extremity of the bone which has been broken. M. Kerst remarks that the fissures is always made in the direction taken by the projectile. Following this indication, he has also, in cases where the wound has been made from above downward, been enabled to amputate successfully at the distance of some few inches only above it.

#### ARTICLE IV.—PREPARATIONS.

##### § I.

The attentions, physical or moral, which we should give to the patient, the preparations to which it is proper he should submit before an amputation, are the same as for every important operation, and vary, moreover, according to an infinity of circumstances. Any time, season, hour of the day or night, may be selected for the performance of amputations, as well as for every other operation of urgent necessity. Generally, however, the morning is preferred if we are allowed to delay, and this because it is more easy to watch the patient during the remainder of the day, than if he had been operated upon at nightfall.

##### § II.—*Dressings*, (*vid.* Vol. I.)

The instruments required to perform amputations that are the most complicated, are a tourniquet, a garrote, a pelote provided with a handle, or other articles suitable to arrest temporarily the current of blood in the limb; knives of different lengths, a straight bistoury, a convex bistoury, a saw with spare blades, a dissecting forceps, curved and straight scissors, cutting pincers, erignes, suture needles, and a tenaculum. For the immediate dressing, we require single, double, triple, and quadruple waxed threads, of which the ligatures of different length and thickness are to be formed; strips of adhesive plaster, lint in the rough, in small balls and plumasseaux, (see Vol. I.,) long, square, and also other shaped compresses; bandages of linen, and sometimes, those also of flannel. We must also have agaric, [or spunk or punk. T.] sponges, and warm and cold water in different vessels; a small quantity of wine, vinegar, and cologne water; a taper, with coals, in a chafing-dish, and a few cauteries, upon the supposition that they may be required.

A. Among these objects there are some which demand every attention from the surgeon. Thus the length of the *knives* should be in proportion to the size of the limb which is to be removed. Those of Wiseman and many of the ancient surgeons had the form of a sickle, for the purpose of dividing at once as much of the soft parts as possible. These curved knives, in general use for many centuries, and which are still employed by M. Osenort for disarticulating the shoulder, have been entirely laid aside since the time of Louis, who clearly pointed out their inutility and disadvantages. At the present day they are made perfectly straight, terminating in a blunt, wide point. Others, on the

contrary, are rounded at their extremity. There are some, also, that are made very sharp at the point, having at the same time but little breadth. M. Weinhold, (*Bull. de Fér.*, t. I., p. 140,) who in order to complete the whole amputation with one instrument, invented a knife-saw, (*couteau-scie*,) has just been surpassed by M. Cazenaud, (*Rév. Méd.*, 1838, t. II., p. 442,) who possesses a *cilexciseur* by which limbs are amputated at a single stroke, as was already done at the time of Botal! The best amputating knives, however, are those whose cutting edge is slightly convex, as recommended by Lassus, and whose width is a medium between the knives adopted by the members or pupils of the ancient Academy of Surgery, and those of some modern surgeons. Their point is neither too acute, nor is it rounded off square, so that it does not become necessary to give to their heel a salient angle in front of the handle which sustains them.

B. The *saw* is an instrument which has undergone still greater variations than the knife. It is important that it should have so much weight, as to require only to be drawn upon the bone, at the time it is in action. Its blade should be properly made tense immediately before the operation, have a slight degree more of thickness at the teeth than near its back, and a range sufficiently prominent to enable it in penetrating to have a free and easy movement. This range is given to it by the manufacturer in disposing of the teeth alternately to the right and left. M. Guthrie recommends arranging these teeth upon two parallel ranks, so that in one their points incline forward, and in the other backward, in order, he says, that they may penetrate as well in advancing as in receding. This modification is not adopted with us. The saw used in England since the time of Pott and Hey, being very light, is more easy of management, but to be well-handled, it exacts more practice than the French saw. The one that Brunninghausen (*Operat. cit.*) claims to be the inventor of before Heine, unites according to the author, the qualities of the ordinary saw with the advantages of that of Pott. The turning saw of M. Thall (*Achiv. Gén. de Méd.*, t. I., p. 268,) is still of less importance. This, however, is not an essential matter in an amputation. In cases of necessity, there is no kind of saw, that may not serve our purpose. Victor Moreau performed his first exsection of the tibia, in 1788, with a joiner's saw, and M. Nève was compelled, M. Champion writes me, to make use of the same tool for an exsection upon the body of this bone.

Be that as it may, it is well in the order of regular surgery, that the saw should always have one or two spare blades; this is a rule which Fabricius of Hilden was induced to adopt, from having been forced to leave an amputation unfinished, until a second saw could be procured for him, to replace the one he had broken. As to the other articles of the dressings, I shall return to them in speaking of their special applications, or of amputations in partieuclar.

### § III.—Position of the Patient.

In hospitals, we generally carry the patient to the amphitheatre, or to a ward specially appropriated for operations, (See Vol. I.) We there place him upon a table more or less elevated, and provided with



mattresses and folded sheets, in certain cases, he is simply seated upon a chair properly arranged. Out of public establishments, we may also select a particular locale, but in general, we operate upon a bed or a chair in the sleeping apartment.

#### § IV.

The *assistants* (Vid. Vol. I.) should each of them have a particular duty assigned to them, and that properly understood beforehand. One of them is charged with compressing the artery. For this purpose we generally select the strongest and tallest, or the one who has the most coolness and intelligence. A second embraces the limb near its upper part, in order to draw up the flesh. The third supports and fixes the part that is to be removed. A fourth is charged with handing the instruments, as they are required. Others seize hold of those various parts of the body, whose movements might interfere with the operator.

#### § V.—*To suspend the Course of the Blood,* (See Vol. I.)

Amputation of the limbs is the operation in which there is the most imperious necessity of provisional hemostatic means. All that I have said of these means, and of the mode of using them, (vid. the preceding and present vol.,) must be borne in mind here. Compression with the fingers or hands does not prevent our having recourse to the garrote or tourniquet. "The garrote, (says M. Champion,) is my favorite means of suspending the course of the blood, because it succeeds better than any other, and because it benumbs the limb." In a feeble subject it becomes a matter of consequence to prevent even the loss of a small quantity of blood; in the country, and where assistants cannot be had, it becomes indispensable; and is also a preventive precaution against consecutive hemorrhage when we are separated some leagues from our patient. "I have seen," says the same practitioner, "the only assistant who was capable of compressing the femoral artery with a pelote, in a case of amputation of the thigh, faint away during the operation, so that the patient would have been exposed to the greatest dangers, if I had not taken his place." The perforated plate of the garrote exposes the ligature to be cut by its edges and I prefer a piece of strong leather. Loder says a single tourniquet is insufficient when the extremities are thin; otherwise we should have to make too violent a pressure. The garrote, properly applied, in no way interferes with our preserving a sufficient quantity of skin to unite the wound.

[Mr. Guthrie states (*Comm. in Surg.*) that he has rarely applied a tourniquet since 1812, and that few persons have performed more formidable operations under more difficult circumstances. He regards the use of this instrument as injurious in amputations at the hips or shoulder joint, and remarks that it should not be used in less dangerous cases, provided sufficient assistance can be obtained. G. C. B.]

## CHAPTER III.

## OPERATIVE METHODS.

## ARTICLE I.—AMPUTATIONS IN CONTINUITY.

Amputations in the continuity of the limbs, which were overlooked in the time of Hippocrates, and almost the only kind since in use, during a long succession of ages, are still, at the present time, the most common; they are performed in three different ways, but principally by the circular, or flap operations.

§ I.—*The Circular Method.*

When we amputate by the circular mode, we have to look successively to the division of the skin, the section of the muscles, that of the bones, the hemostatic means, and the dressing of the wound.

Α. *Division of the skin.*—Celsus, (*De Re Mèd.*, lib. VII., cap. 33,) Archigenes, (*Collect. de Nicetas*, p. 156,) Gersdorf, (*Sprengel, His. de la Méd.*, t. VII., p. 314,) Paré and Wiseman, (*Chirurg.*, etc., Vol. II., p. 220,) as Louis, (*Mèm. de l'Acad. de Chir.*, t. II., p. 248,) Dupuytren, (*Lçons Orales*, t. IV., p. 298,) and many others have done since, divided the skin and certain muscles at the same stroke. It appears on the contrary, that Maggi (*De Vuln. Bomb. et Stop.*, etc., 1552) drew it up at first to sufficient extent to be enabled afterwards to cover the surface of the stump with it. This precept, nevertheless, was rarely followed in ancient times, and it is to J. L. Petit, (*Malad. Chir.*, t. III., p. 136,) to whom the credit is due of having caused it to be adopted.

I. After having circularly divided the cutaneous envelope of the limb, Petit caused it to be drawn up by an assistant, or did it himself, to the extent of almost two fingers' breadth. Cheselden adopted the same mode, and nearly about the same time.

It was Alanson, (*Practical Observations*, etc., 1779,) as it seems to me, rather than Brunninghausen, who was the first that advised to dissect it, and turn it back from below upwards, after the manner of a kind of ruff, as M. Richerand, (*Nosogr. Chir.*, etc.,) and many other French surgeons have done, at a later period. MM. Guthrie, (*On Gun-shot Wounds*, &c., 1815,) Graefe, (*Normen für die Ablösung grösserer Glieder*, etc., 1812,) &c., are of opinion that we may, without any impropriety, divide the aponeurosis and some of the muscular fibres at the same stroke; that we are thus more sure of thoroughly dividing the skin, and that this membrane then retracts with more facility. Hey (*Observ. de Chir.*, edit. 1814) and Langenbeck (*Biblioth. Chir.*, et *Nosol. und Ther.*) are of a contrary opinion.

II.—But what advantage is there in avoiding with so much care, the periphery of the aponeurosis and muscles? Whether the knife penetrates a little more or a little less, so long as the teguments are divided through their whole thickness, the remainder of the operation is rendered thereby neither more nor less difficult. Surgeons who, like Hey

and M. Brunninghausen, (*Nouv. Biblioth. German.*, t. II., 1821,) prefer to have the stump completely covered by the skin, have laid it down as a principle that we must first measure the circumference of the limb, in order to preserve two inches of the integuments, as, for example, when we are to have a wound of four inches in width. Lassus (*Méd. Oper.*, t. II.) says he has followed this practice with success.

III.—In my opinion, precautions so minute are utterly useless. The best plan, when it is not our intention to cut down at once to the bone, is to divide with the amputating knife the different cellulo-fibrous bridges which attach the external envelope to the subjacent parts, while at the same time an assistant, or the operator, draws it back with considerable force towards the upper part of the limb. The pain is less acute, and the skin preserves a thicker lining than when turned up like a ruff, and nothing is easier than to raise it in this manner to the extent of two or three inches.

To effect this division the hand of the operator is passed under the parts, and in describing an arc he brings the knife upon the anterior surface of the limb. It is unnecessary to follow here the advice of Mynors, (*Practical Observations on Amputat.*, &c., 1788,) that we should incline its cutting edge from below upwards in order to divide the integuments by a sloping edge, (*en biseau*.) They are to be divided perpendicularly, while we draw the knife from its heel to its point, making thus as complete and regular a circle as possible. The hand is first turned in pronation, and gradually comes into supination, as it passes from the inner side of and then underneath the limb. If we prefer making this incision at one stroke, the hand turns insensibly upon the handle of the instrument so as to become gradually placed into forced pronation in terminating the operation. By this means we avoid that disagreeable and fatiguing twisting backwards of the wrist that most surgeons make who do not wish to repeat their incision. With practice it is very easy to cut in the manner I mention; but I cannot see what great inconvenience there would be after having divided the skin upon the inside, outside and underneath, to withdraw the instrument, as a great number of French surgeons do, in order to re-apply it in front to unite by means of a second cut the two extremities of the first wound. However, this is clearly a matter of option and not of necessity.

B. *Division of the Muscles*.—The section of the muscles more particularly is the point which seems to have occupied the attention of operators for a century past. At the time of Celsus the knife was carried a little higher up than the dead parts (*des parties mortes*;) the integuments and the whole thickness of the muscles were divided by the first cut; then the deeper muscles were detached and raised up in such manner that the bone might be sawed a little higher up, and these muscles afterwards be brought back upon the wound. This precept of Celsus, which Paré (*Œuvr. Complét.*, liv. XII., ch. 30, p. 339) and Pigray (*Epitome*, p. 128—129) seem also to have adopted, was for a long time neglected; and Wiseman, J. L. Petit, and Cheselden, in making the division of the soft parts at two separate incisions, appear to have also themselves forgotten it.

I. It was Louis who clearly pointed out that the cone-like shape of



the stump, an almost constant result of the ancient methods was owing much more to the retraction of the muscles than to that of the skin. He therefore advised that the muscular layers should be divided by two successive cuts. With the first incision Louis divided the integuments and superficial muscles, causing them at the same time to be drawn back with as much force as possible, so as to favor their retraction by every means in his power. The deep layers were divided by a second cut; after which he made the section of the bone in the ordinary manner.

II. Le Dran (*Operations*, etc., p. 556) says: "With one stroke I divide the integuments and one half the thickness of the muscles; I then immediately cause the skin and flesh to be drawn back as much as possible, and make a second incision in a circular direction and upon a line with the skin where it is drawn back and divided. By this last I cut none of the skin, but only the muscles down to the periosteum." This process has much resemblance to that of Pigray (*Epitome*, p. 128, in 12mo, 1615) or Celsus, and differs also as we see but very little from that of Louis. But it is this last author to whom the credit is due of having made its importance appreciated.

III. Valentin (*Recherches Critiques sur la Chir.*, p. 135) in his Critical Researches on Surgery, conceived that in order to divide the muscles it was necessary to put them successively in a state of extension at the moment when the knife was about to be applied to them; so that in the thigh for example, while the instrument was making its circuit, the limb, in adopting rigorously the rule of Valentin, would have to be thrown first backwards, then outwardly, then forwards, and finally inwards. This whimsical recommendation has not had and ought not to have any partisans.

IV. That of Portal (*Acad. des Sciences*, t. CXXXVIII., p. 693, in 12mo, Ann. 1777) who reversing the precept of Valentin, recommends that in dividing the flexor muscles the limb should be held in the utmost degree of flexion possible, and in a state of extension for the division of the extensor muscles, has not met with any greater success, though according to the author, Maréchal made use of it at the hospital of Strasbourg.

V. Desault (*Œuvres Chir.*, t. II., p. 547) combined the methods of Petit and Louis, that is to say, he recommended with the first of these authors first to divide and draw back the skin, and with the second to divide afterwards the superficial muscular layer on a line with the skin as drawn back, and to begin the section of the deep muscles at the line where the first had been retracted.

VI. After having dissected and turned back the skin, Alanson divided the whole of the muscles with a single stroke of the knife, taking care to direct the cutting edge of his instrument obliquely upwards, and to carry the point of it still more obliquely around the bone, with the view of obtaining a hollow cone whose base should be at the periphery of the wound. M. Langenbeek opposes this mode of proceeding, and Wardenburg, in maintaining the impossibility of forming a hollow cone, by following implicitly the process of Alanson, says that the knife held obliquely will of necessity take a spiral instead of a circular direction. Loeffler and Loder on the other hand endeavored to show that it was an easy matter to correct this tendency of making a spiral inci-

sion. It would appear that MM. Langenbeck and Graefe upon this point have misconceived the process of the English surgeon. In fact Dupuytren constantly employed this process at the Hôtel-Dieu with the greatest success. In order that the knife when carried obliquely may not deviate from the circular direction, it suffices to hold the handle properly, in proportion as the blade penetrates. Alanson moreover had observed that it was principally by means of its point that we hollow out a cone through the muscles.

VII. In the process of Dupuytren an assistant forcibly draws back the soft parts; the operator holding the knife by the mode of Alanson then divides the skin and the whole thickness of the muscles with a single stroke; he then immediately brings back the instrument held in the same manner, upon the base of the fleshy cone which is left upon the bone by the retraction of the superficial muscles. This is done with extreme rapidity, and the result of the process is the formation of a perfect hollow cone, which apparently is exceedingly favorable to the union of the wound.

VIII. Bell (*Cours de Chirurg.*, trad. par Bosquillon,) after having divided the skin in the manner of J. L. Petit, and the muscles according to the method of Wiseman, passed his amputating knife between these latter and the bone, in order to divide their adhesions to the extent of about two inches, and in this manner to raise them with greater facility.

IX. All these processes have undergone other modifications which it is unnecessary to enumerate. The brevity of the text of Celsus has not prevented us from discovering in this author the origin of the process of Petit, Louis and Bell, and even that of Dupuytren; but if it be questionable that any surgeon at that epoch followed a method at all comparable with those which are adopted in our days, it is not so with that which Pigray describes in the following manner:—"After having drawn the skin back with the two hands, we must cut all the muscles around the limb *above* the disease; we then, with a *split compress*, raise up the divided muscle in order to saw the bone *as high up* and as near the flesh as possible. The hemorrhage being arrested by caustics, astringents or the *ligature*, we bring back the skin in order to adjust it in front of the wound by *two stitches* of suture placed across it.

X. What is remarkable in all these processes, in appearance so different, is this, that when closely examined the most of them lead to the same results. Whether the skin and superficial muscles are divided with the first cut and the deep-seated muscles with a second incision after the manner of Louis; or we adopt, on the contrary, the rules laid down by Dupuytren; or whether the section of the soft parts be made in three stages, as Desault recommends, or in the manner Alanson made this division, or as Bell advises; so long as we take care to favor the retraction of the muscles, the bone is laid bare at two, three and four inches above the point where the incision commenced. The division of the muscles in amputations, in conformity with either this or that mode, is therefore a matter of much less importance than some people suppose.

XI. The process of Bell found, in 1829, a new champion in M. Hello, (*Thèse* No. 258, Paris, 1829,) formerly a naval surgeon, who recom-

mends that it should in every case be substituted for the process of hollowing out the muscles (*i. e.*, the process of the hollow cone. T.) and it is the one M. Champion usually adopts. In the trials I have made of it, it has in reality appeared to me that the muscles thus detached readhere with greater facility upon the front part of the bone, and that they could be more readily put in contact and kept approximated face to face, from the bottom to the borders of the wound, than by any other method. The only difficulty is that the operative process is a little longer and not so easy.

XII. With the view of preventing too great a shock upon the system, Faure (*Encycloped. Méthod. Méd.*, t. II., p. 210) seriously proposes to take off the limb by a succession of operations in three, four or five times for example, at 4 to 5 days apart; the first section to comprise a fourth of the circumference of the part, I suppose; some days after another fourth to be divided and so on to the conclusion. Faure even asks the question whether it would not be advisable to allow the first wound to cicatrize before proceeding to the second!

XIII. *The author.* The most rational, surest, and the most generally applicable method is as follows:—The skin is divided with the first cut without endeavoring too scrupulously to avoid the subjacent parts. An assistant raises it up while the surgeon divides the bridges which attach it to the aponeurosis or muscles, to the extent of two to three fingers' breadth. The knife now applied on a line with the retracted skin, passes circularly and perpendicularly through all the muscles down to the bone, or at least sufficiently near the bone for the superficial layer to be completely divided. The assistant again forcibly draws back the parts, and the surgeon, with a second cut, divides all the fleshy fibres of the deep-seated layer, at the point where this layer passes under the retracted extremities of the muscles that were first divided. Whether the knife be held obliquely or perpendicularly makes no difference in the final result; whether we go immediately down to the bone or merely to the deep-seated muscular layer is all the same. In both cases, however, we have to make a second division of those fleshy fibres most adherent to the bone and at two or three inches above the place of the first division. I divide the tissues perpendicularly, in order to obtain a cleaner section and a less extended traumatic surface.

C. The section of the muscles being completed, we raise them upwards by means of a *retractor*. Formerly they used for this purpose bags of wool or linen, or pieces of leather, and even of metal. Fabricius of Hilden, Gooch, Bell, and Percy have severally extolled these objects; but at the present time we require only a simple split compress, with two tails for the thigh and arm, and three for the leg and fore-arm. The undivided portion of this compress is drawn back upon the posterior in preference to the anterior portion of the muscles, as M. Graefe recommends; while its two free extremities are crossed and turned back in front; the assistant who embraces the whole with the two hands thus draws the soft parts backwards, to protect them from the action of the saw. It is requisite, moreover, that this split compress, to which some surgeons, smartly reproved for it by Petit, have objected on the pretext that it interferes with the action of the saw, should be made of strong linen and wide enough to extend beyond the sides of the wound.



I. Before proceeding farther, most surgeons recommend dividing and carefully scraping the *periosteum*. It was with the back of their great sickle that Paré and Wiseman effected this denudation. Since that time the bistoury or the edge of an ordinary knife has been preferred for that purpose. Some with Graefe perform this from above downwards; others with Brunninghausen detach the periosteum in this manner from below upwards, or like M. V. Onsenort, form a flap with it in order to bring it down afterwards upon the section made by the saw.

II. All those *precautions are useless* as Alanson, MM. Guthrie and Cooper, and before them J. L. Petit and Ledran, had already pointed out. The motive in recommending them was to obviate the increase of pain, or to prevent tetanus, exfoliation and inflammation of the bone as well as the suppuration of the surrounding parts; as if the periosteum could have the least to do with the production of such phenomena! When it has been carefully separated, one of two things must happen: 1, The saw is applied a little higher up than the surgeon is aware of, and then it is the same as if no regard was paid to it; 2, the saw is in reality applied to the denuded portion of bone, and in this case it would be strange if there should not remain higher up a small portion which has been deprived of its envelope. In fine, if the surgeon attains the object he has in view, the precaution is injurious, and if he fails, it is, to say the least, useless. He must confine himself, therefore, to detaching carefully the fleshy fibres with the knife or the bistoury.

D. *Section of the Bone*.—Having done this, he embraces the limb with his left hand, placing the thumb immediately above or below the point which is to sustain the action of the instrument. The saw, held in his right hand, is applied perpendicularly; we first move it rapidly with short cuts until it has worked itself a passage; afterwards, we draw it through the whole extent of its blade, pressing only moderately upon it. So long as it has not yet made its way through the thickness of the bone, we may move it with rapidity; but as soon as it has nearly completed the section, we must proceed with the utmost degree of caution. It is at this moment that the two assistants who are holding the two opposite portions of the limb, must redouble their attention in order to keep these in their natural direction. If the assistant who holds the diseased portion, lowers it, the bone almost unavoidably breaks before being entirely cut through; if he raises it, on the contrary, the progress of the saw will soon be arrested, and the operation thus rendered more difficult. It is necessary that the operator should make himself familiar with handling this instrument, and when he uses it he should take care not to incline it either in one direction or the other. By attending to all these precautions, the bone is usually sawed off neatly. Nevertheless, if any points or roughnesses remain upon the extremity, they should be immediately removed with the cutting forceps, as is usually done, or what appears to me preferable, by means of a small saw, or when they are of considerable length, by using the same saw which has served for the amputation. The edges of the sawed bone are usually quite pointed and sharp. Some practitioners, indeed, as MM. Graefe and Hutchinson, have advised that these should be smoothed down with a file, or with the cutting edge of a strong, short

scalpel, but this practice has rarely been imitated by other operators. Theory and observation unite, in fact, in showing its inutility.

## § II.—*The flap operation.*

The flap operation which Sprengel (*Histoire de la Méd.*, t. VII., p. 316) and Gagnier (*Thèse de Haller*, 1734, t. V.) seem disposed to ascribe to Celsus, to Maggi and other ancient surgeons, such as Paré and de Hilden, was not, as it is generally believed, proposed for the first time by Lowdham, in his letter to Young, in 1679. We shall see farther on, that Leonidas and Heliodorus describe it with sufficient clearness. It consists in cutting at the expense of the soft parts one or two flaps, which enable us to close the wound immediately and completely. After Lowdham, this method was extolled and variously modified, by Verduin of Amsterdam, in 1696; by Sabourin, of Geneva, in 1702; and by Morand, De la Faye, (*Acad. Roy. de Chir.*, t. II., p. 243,) and Garengot, (*Ibid.*, t. II., p. 261,) before the middle of the last century. At first opposed by Koenerding, (*Sprengel, Oper. cit.*, t. VII, p. 318,) countryman of Verduin, and by Heister and many others, it was soon defended again by P. Massuet, (*Amput. à Lamb.* Paris, 1751,) Le Dran, Ravaton, and Vermale. Since then, O'Halloran, Dupuytren, Roux, Guthrie, Klein, Kern, Langenbeck, Larrey, and a multitude of other surgeons, have frequently had recourse to it. Its history presents two epochs that are quite distinct; one that comprises all that was said of it in the last century; the other, that which belongs more especially to the present time.

A. *Appreciation.*—Lowdham (Young, *Currus Triumph.* à tereb., 1679; *Mém. de l'Acad. Roy. de Chir.*, t. II., p. 244,) maintains that the flap operation is more prompt and less painful, and that it exposes less to tetanus and hemorrhage than circular amputation, that it renders the ligature upon the vessels useless, prevents exfoliation, obtains a rapid cure, and allows of an extremely easy adaptation of an artificial limb.

There is a considerable number of these advantages that experience has not corroborated. In the first place we cannot see how the flap amputation can be less painful or be more certain to prevent tetanus than the circular method. Exfoliation is a rare occurrence, instead of being constant, as it was then believed to be. As the artificial limbs are not to be applied upon the apex of the stump, it is a matter of indifference in this respect, whether the amputation has been performed by one method or the other. In fine, it is easy to perceive that we cannot dispense with tying the vessels, and that the wound scarcely ever cicatrizes without suppurating for a greater or less length of time. Its immediate reunion, however, is an incontestible advantage; and did not the improvements of the circular method allow of our accomplishing in most cases the same result, there is no doubt that the flap operation at the present day would have been generally preferred. We must allow, also, that it generally enables us to avoid with facility the projection of the bones and the conicity of the stump, and to preserve as much of the soft parts as are necessary to uniting without traction the widest and deepest kind of wounds.

B. *Processes*.—The flap amputation is performed by two general methods, the one from without inwards, the other from within outwards. In one we divide from the skin to the bones, while in the other, we commence by thrusting the knife through the limb, so as to cut the flap from the root to its free border. If the first mode is more regular and sure, the second is more rapid and brilliant.

From *without inwards*, it is well to begin by dividing the integuments with a single stroke ; we then cause the assistant to draw them back, in order that with a second cut we may effect the division of the muscles a little higher up. In proceeding in this manner, it is easy to give to the flaps the form and dimensions desired, but the operation requires several stages, and is not as rapid. If we plunge through the flesh, *at first* the point of the instrument, in danger of striking against the bones, often wounds parts that we should have preferred to avoid, divides irregularly certain tissues whose exact (*nette*) section is a matter of some importance, and does not always allow of our cutting flaps as thick as they should be for the object we have in view. Nevertheless, this mode of operating has found in our times, especially in dissecting rooms, and among those who practise upon the dead body, numerous and intelligent partisans ; but it is scarcely ever employed, any more than the preceding mode for amputation in the continuity.

In conclusion, too much importance, as I think, has been generally accorded to the flap operation. The wound which it causes has necessarily a much greater extent of surface than if it was circular. The muscles which this mode deems it so important to preserve, are exposed to various accidents. If they should be attacked with inflammation, they suppurate most abundantly, absorb the fluid like a sponge, and favor to a remarkable degree purulent infection and phlebitis. On the other hand, they scarcely ever become adherent to the apex of the stump in the centre of the cicatrix. By whatever mode we may proceed, it is the skin which finally becomes united to the cut surface of the bone, and the side of the flaps through means of the retraction of the angles of the wound, favors to a greater degree than any other method the protrusion of the bone.

C. The flap method moreover presents a number of distinct modifications. Lowdham, Verduin, Labourin, M. Guthrie, and M. Graefe, confine themselves to a single lower flap, which they bring up in contact with the bleeding surface. Vermale recommends cutting one on each side, and to make them by plunging the knife down to the spot where the bone is to be sawed. That we may not be deceived in regard to the length, he proposes, before we commence, that we should mark out with a red thread the point of departure and the point where we are to terminate. Ravaton and Bell, with one stroke of the knife, divide circularly the skin and the entire thickness of the muscles ; another incision, which strikes upon the bone in front and behind, in a direction parallel to its axis, then allows of the separation of the two flaps, which are dissected off and raised up immediately after. The process of Vermale is at present the only one, or almost the only one, employed, even for the formation of a single flap. The mode of Ravaton ought not, in fact, to be followed. The circular incision which it first makes, is altogether so much loss. The flaps cut out in this manner, square,



have too much thickness at their apex, and interfere to a considerable extent with their immediate union. When, on the contrary, they are cut with slanting or bevelled edges, they adapt themselves to each other accurately, even though we neglect the rule laid down by Mynors, that the skin should also be divided in a very oblique direction at the expense of its deep-seated layers.

D. *Two flaps* should be preferred when we have it in our power to give them nearly the same degree of width and thickness, whereas, if we are unable to give to either one of them the proper dimensions, it is better to cut one only. If the wound or the disease which compels us to amputate should leave considerably more sound tissue on one side than on the other, and has thus in some degree indicated the character of the flaps in advance, we should avail ourselves of it. After having completed the section of the bone, we then equalise the fleshy parts in order to cover the stump with them. Nevertheless, it becomes necessary in this last case, in order to close the wound, that the flap, if there be but one of them, should have considerable length, and that it should be bent almost to a right angle and submitted to compression and tractions, which nevertheless endanger the success of the operation. With two flaps, on the contrary, one in front and one behind, as M. Walther (*Rust's Handbuch der Chir.*, t. I., p. 609) advises, the bleeding surfaces are adjusted to each other without the least difficulty.

E. Kirkland, who excises the two angles of the wound, and M. Larrey, who confines himself to slitting them afterwards to the extent of half an inch, make in this manner a sort of flap operation out of the circular method. M. Sédillot has remarked that in most of the methods of disarticulations in which a flap is cut in terminating the operation, the knife almost always encounters a difficulty in getting below the bones that are to be removed; the angles of the wound moreover being stretched and bridled, are thus jagged and cut to a greater or less depth by means of the instrument. To avoid this inconvenience, M. Sédillot incises at first about a third of the extent of the flap with the heel of the knife or bistoury, and afterwards experiences no difficulty in finishing the operation without injuring the angles of the wound. In the continuity of the limbs, at the thigh, the upper part of the leg, and at the arm or fore-arm, M. Sédillot cuts two small, short, rounded flaps, which are then raised up to complete the operation by the ordinary processes for circular amputation. We thus unite the advantages of wounds with double flaps to those of circular amputation, the bones being covered over in a proper manner, and prevented from projecting at the angles of the wound. I have recently, says the author, applied this method to the fore-arm, and obtained the most satisfactory results. We shall see, in describing amputations in particular, what are the cases which do not admit of this mode of operating. M. J. Cloquet has suggested that in certain cases, after having cut through the skin circularly, it would be better, instead of dividing the other soft parts in the same manner, to plunge the knife between them and the bones, in order to cut from within outwards as in the flap method. Finally, Dupuytren, M. Larrey, and others have frequently endeavored to combine the ovalar with the ordinary flap operation, by commencing with the division of the skin from without inwards, and terminating with the division of the muscles from within outwards.

§ III.—*The Ovaral Method.*

The ovaral method, though more recent than the two others, and already described in the commencement of this century by Chasley (Rust's *Handbuck der Chir.*, t. I., p. 593) and M. Langenbeck, (*Thèses de Paris*, 1803,) and by Lebas, (*Bull. de la Fac. de Méd. de Paris*, t. V., p. 417—420,) who explains it in a memoir, upon which Bécларd reported to the Society of the Faculty of Medicine, and afterwards by MM. Guthrie and Richerand, for certain kinds of amputation only, was not in reality introduced into practice until in the year 1827, by M. Scoutetten, (*De la Méth. Oval., ou Nouv. Méth.*, etc., Paris, 1827.) According to this last surgeon, its great advantage consists in always allowing us to cut from without inwards, that is, from the superficial to the deep-seated parts, as in the circular method, and of preserving also a sufficiency of the flesh and soft parts to enable us with ease to bring the lips of the wound into coaptation, as in the flap operation; so that it occupies, as he says, the middle ground between the two other methods, and is the link which either separates or unites them. It is certain, that by the ovaral method, we obtain a neat and regular division; that for the most part, we may preserve a sufficiency of tissues to undertake immediate reunion; and that there are but few points upon the limbs to which it is not applicable, unless it be in the continuity of such as present length enough to make the circular or flap method easy and sure. Its distinctive characteristic is to form a wound of an ovoid shape, as already pointed out by Lassus, in 1793, M. Chasley, in 1803, or 1804, and M. Langenbeck, in 1809, and on which account M. Scoutetten has given it the name which I have retained. It consists of two processes which differ but little from each other. In the one case, which is the most ancient, the operator begins by circumscribing a triangular flap in the form of an inverted V, a little under the place where he proposes to use the saw or to disarticulate the bone. After having depressed the summit of this triangle, and separated the two lips of the wound, he passes from above downwards, or from one side to the other, using the saw in amputations at the continuity, and the knife in cases of disarticulation, grazing the posterior and deep-seated surface of the bone, and terminating by uniting the two first incisions at the base of the V, where the vessels had been preserved. M. Scoutetten prefers giving at the very first a perfectly oval form to his incision; except that he takes care in passing under the plexus of vessels and nerves and near the point which is to form the larger extremity of the oval, to go no deeper at first than the tegumentary tissues. This is no farther important than that it gives a little more regularity to the incision. The oval method has the advantage of uniting all that is most approved of, both in the circular and flap processes. I have frequently used it, but shall examine it more in detail in the chapter on *Amputations of the Joints*.

## ARTICLE II.—AMPUTATION IN THE CONTIGUITY.

The perusal of the works of Hippocrates teaches us that there was a species of amputation at the joints, sometimes practised among the

ancients. Galen and Heliodorus also speak of it in sufficiently clear language. The Arabs themselves were not ignorant of it, and Sprengel is evidently in an error when he says that, from the time of the Greek writers down to Munnieks, nobody makes any mention of it. Guy de Chauliac states positively that, "if the disease invades the immediate neighborhood of the joint, the limb should be taken off at the joint itself, by means of a razor or other instruments, and *without sawing*." Nor has Paré passed it over in silence. Fabricius of Hilden, speaks of it as a common process ; and Pigray thus expresses himself upon this subject: "Some start objections to cutting in the joint itself, or near it, because of the nervous parts, nevertheless, the dangers from these are not so very great: *I have seen many such (amputations) which have done well.*" The labors of Ledran, Morand, Heister, Brasdor, and Hoin, therefore, have done no more than to revive this operation, by dispelling the prejudices with which the physiology of the middle ages had invested it. It is performed like amputation in the continuity in three principal ways, but more especially by the flat or the ovalar method. We shall see, farther on, however, that the circular method is perfectly applicable to it, and that this ought, in a large number of cases, to have the preference.

The advantages of disarticulation are, that it is more prompt and easy than amputation in the body of the limbs ; that it does not require the section of the bones, is more favorable to immediate union, and enables us to preserve a longer stump. Its disadvantages, at least in a larger number of cases, are : that it lays bare extensive osseous or cartilaginous surfaces ; that it obliges us to carry the instrument upon the thickest parts of the bones, which are least abundantly supplied with soft parts, and to make use frequently of tendinous or synovial tissues for closing the wound ; and that it also makes a solution of continuity, somewhat irregular : but it is not true, other things being equal, that it endangers, more than amputation in the continuity, as had been for a long period thought, nervous symptoms, tetanus, abscesses, purulent collections, and symptoms of general reaction. It requires but few instruments, and no necessity of such complicated dressings as are demanded in amputation in the continuity. A knife or simple bistoury are generally all that are needed to perform every step of the operation. So also have we less to fear from the concavity of the stump, the projection of the bones, or the retraction of the muscles. As the soft parts are but slightly displaced, the adhesion of the flaps is obtained with facility, and the inflammation proceeds no farther than is requisite to secure immediate union. The division acting only on the skin, the cellular and fibrous tissues and some of the attachments of the muscles ; inflammation, abscesses, and constitutional reaction, are in general but little to be apprehended. Though very large in appearance, the wound has in reality but very little extent ; because the cartilaginous surfaces at the bottom of it, being deprived of all sensibility and wholly inert, take no part in the process of suppuration or inflammation. M. Kerst, professor in the military hospital of instruction at Utrecht, prefers, as a general rule, disarticulation to amputation in the continuity, because from the last we have to apprehend traumatic fever of a pernicious (per-



nieieuse) and intermittent character, together with inflammation of the veins in the sawed bone.

The dread which prevailed among surgeons of the last century, of wounding the inter-articular cartilages, exposing them to the air, and touching them with the instrument, is at the present day entirely dispelled. In place of all those precautions formerly recommended in order to avoid the articular surface, which constitutes the bottom of the stump, some modern surgeons go to the extent of advising that it should be wounded expressly. For example, M. Gensoul (*Thèse* No. 109, Paris, 1824) is of the opinion of Richter and Bromfield, that in scarifying it with the point of the knife, we have a better prospect of cicatrization by the first intention. This practice, adopted also by some surgeons of Paris, and which is attended with no inconvenience, seems, nevertheless, to be sustained upon a position which is far from being demonstrated. In fact, it is incorrect to say, with Béclard and many others, that after amputation in the *contiguity*, [*i. e.*, in the joint, *vid. supra*. T.] the smooth face of the cartilage does not unite with the flaps, but remains free even after the final cure, unless by some means or another, inflammation has been excited. This can only take place by exception. Whether the instrument comes in contact with it or not, it nevertheless contracts, and that speedily, firm adhesions with the tissues that cover it; and it is as useless to scrape it with a scalpel as to cauterize it, in the manner practised in the time of Heliodorus. If the agglutination is not immediate, the cartilaginous surface, acted upon by the cellular granulations which are formed upon the bone, soon detaches itself, sometimes in fragments, sometimes in large pieces, at other times in the form of a shell, and soon completely exfoliates, leaving exposed a vermilion-colored wound, which afterwards cicatrizes with great facility. In the contrary case it does not perceptibly change its appearance; it only loses its polish and becomes rugose, but a molecular action soon develops itself, erodes, and insensibly dissolves it, until it has totally disappeared. Constituting the true epiderm of the bones, and consisting of a simple anhiste tissue, it cannot, with the attributes that belong to it, exist any longer than while the articular movements are preserved. As soon as the living tissues rest permanently upon it, the vitality of the bones, properly so called, begins to act upon it and to destroy it, by creating the cellulo-fibrous deposition, which is the base of every sound cicatrix; unless in its actual state of cartilage, it becomes agglutinated to the soft tissues, by becoming, as M. Champion thinks, organized and blended with them. By one mode or the other, the tendons, aponeuroses, nerves and vessels ultimately become firmly adherent upon the extremity of the stump, so much so, that the patient is enabled to move it with as much facility after the cure as before the operation.

When the articulation is surrounded with a large capsule, it is well to remove as much of it as possible with the bone, without however giving ourselves any great uneasiness about such part of it as may remain. In place of leaving the tendons hanging out of the wound, they should on the contrary be cut off as low down as possible, that their presence may not interfere with the immediate union. The incision into the fibrous and synovial sheaths, as recommended by Garengéot and Bertrandi, with the view of preventing their inflammation and the

formation of purulent collections, is useless, and should not be practised unless there are particular indications for it.

The fistulas which sometimes follow amputations at the joints, are owing either to some point of the cartilaginous surface which has not exfoliated or become adherent to the flap of the soft parts, continuing to exude synovia; or to one or more of the tendinous sheaths which have not closed, furnishing fluids of the same nature in quantities sufficient to become an impediment to the agglutination of the tissues. These difficulties are in general very easily overcome, and almost always without any serious consequences, by means of compression, stimulating injections, cauterization, &c. Moreover, amputations in the continuity are by no means absolutely exempt from such accidents. If, therefore, in amputating below the articulation we can remove all the disease, and at the same time preserve a sufficiency of tissues to close the wound, amputation in the continuity ought to have the preference; on the contrary it is better to amputate at the joint than to go above it. On the other hand, if in amputating at the articulation we should incur the risk of not removing all the disease, we should renounce it and carry the instrument higher up. When in amputating in the continuity we are obliged to make the section of the bones too near the great synovial cavities, disarticulation is the preferable course. The danger of purulent arthritis is then too imminent not to justify the immediate sacrifice of the joint. All these questions, moreover, have been judiciously examined by M. Sédillot, (*Thèse de Concours*, 1836.) In conclusion, the extirpation of the limbs is not more dangerous than their amputation, properly so called, and it is the extent of the disease and the functions of the organ to be removed, which are to influence the surgeon in his preference for one of these methods over the other, in the particular cases that present.

### ARTICLE III.—THE DRESSING

#### § I.—Hemostatic Means.

To prevent the flow of blood after amputations, is one of those indications which has most engaged the attention of surgeons at every epoch; and what I have said of hemostatic means in treating of operations in general (vid. Vol. I.) are especially applicable to amputations.

A. At the present day we are no longer under the necessity of recommending to surgeons the remedy eulogized by Galen, of one part incense and a half of aloes with the white of an egg; nor the mushroom nor puff-ball vaunted by Van Horn, and revived by Vurtz, (*La Chirurgie*, p. 36;) nor Fowler's powder, nor hog-excrement, nor the powder of burnt agaric mentioned by Charmetton, nor the thrusting the arm into the bowels of a cock opened alive, after having cut off the wrist, as did that brute mentioned by F. Platter, (*Bonet*, t. III., p. 145, liv. 4, obs. 25;) nor the animal oil of Dippel given internally by Schulze, (*Rondelai, Hemorrh. Internes*, p. 90.—*Thèse de Paris*, in 8vo.) The hemostatic bladder, used by Gersdorf, (*Chirurgien d'Armée* in German, p. 63, 1527,) reintroduced by Wiseman and afterwards by Fabre, (*Essais sur divers Points de Physiologie*, p. 160, 1770.—*Recherches des*

*Vrais Principes de l' Art de Guérir*, p. 531, 1790,) and on one occasion made trial of on the fore-arm with success by Fresearode (Fabre, *Recherches*, &c., p. 278, 1783) are equally useless. Nor has the reunion of the wound by flaps and compression, which answered the purpose with Verduin and Sabourin, and which Kock has so much eulogized, and Smith employed, any longer to be discussed, even though we should combine with it like Garengéot (*Mém. de l' Acad. de Chir.*, t. II., p. 180; and tom. V., p. 263) a ligature on the principal artery. It is effectually the ligature or torsion that we must have recourse to after amputations, unless in cases altogether of an exceptional nature.

B. It was for a long time thought advisable to include a certain portion of tissue in the ligature upon each artery. If Fabre is to be believed, (*Oper. cit.*, p. 278, 1783,) it was Ferrand who first resorted in amputations to direct ligature upon the artery. The author of a thesis upon surgery at that time also made the same remark. Desault (*Journ. de Chir.*, t. IV., p. 203) according to Bichat (*Eloge de Desault*, par Bichat, p. 43) had recourse to this means, Louis being present, at the Bicêtre in 1779, and before any other modern. Pouteau (*Ancien Journ. de Méd.*, t. XLVIII., p. 440, 1777) recommended also that the artery should be isolated on each side the ligature, in order to prevent accidents. Nothing analogous to this is in practice at the present day. The tenaculum of Bromfield under this point of view has naturally carried us back without any disadvantage to the time of Avicenna; the artery is to be denuded, that is, stripped of the flesh that invests it, says the celebrated Arab, (*Guy de Chauliac*, trad. de Mingelouseaulx, t. I., p. 112; *Des Plaies*, ch. IV., *Quatrième Façon d'arrêter le Sang*;) we then seize hold of it with a small hook, draw it gently outward, pass under it a thread of silk, and then tie it with a firm knot.

In order not to entrust to an inexperienced assistant the direction of the ligature, Brunninghausen (*Expér. et Obs. sur l' Amput.*—*Gaz. Méd. Chir. d' Ehrhart*, 1818, et *Nouv. Bibl. Germanique*, t. II., 1821, p. 51) makes use of a small fork with blunt points, by means of which he passes the thread above the artery, until the assistant has tightened the knot outside of the wound, and in a horizontal direction. As large as well as small arteries are to be tied, the author has had constructed a double instrument, the branches of which separate farther apart on one side than on the other, so that by means of the narrower extremity we may also bring up to a level with the wound the arteries that have retracted too deeply; and likewise separate them from the nerves and other parts with which they may be united; but the spring forceps described in the article on torsion, (vid. Vol. I.,) and the *pincers-portenauuds*, as contrived by MM. J. Colquet and Colombat, would be much preferable, if under such circumstances there should be any necessity of a particular instrument.

The ligatures required, also sometimes amount to a considerable number. Loder (*Bibl. Germ. Méd. Chir.*, trad. Françe., t. II., p. 94) relates that he was obliged in a case of amputation of the leg in an infant, to use sixteen before he could effectually arrest the hemorrhage. In another case he used nineteen, and several smaller arteries were included in the same ligature. The first case recovered in twenty-five days; but in the other the flap, on removing the dressing on the fifth



day, was found to have become detached. In other cases there is *no hemorrhage, and the ligature is inapplicable*, for we find no arteries, (Taxil Saint-Vincent, *Jour. Univ. des Science, Méd.*, t.—, p. 324.) I have elsewhere detailed (*Jour. Hebd. Univ.*, t. I. et II.) numerous examples of this kind. Zinc (Chalmail, *Recherches sur les Metastases*, p. 265) has seen this in the fore-arm, Chalmail (*Op. cit.*, p. 265) in the arm; Leveillé, Briot, and all army surgeons have frequently made the same remark, (Gaultier de Claubry, *Jour. Gén. de Méd.*, t. XLVII., p. 238.) It is necessary that the ligatures should be very firm. Morand (*Opusc. de Chir.*, t. II., p. 268) on one occasion found that all the ligatures handed to him snapped, the threads, according to the author, having wasted away from their being so old. After this nothing is more embarrassing than ligatures that are too long; fifteen inches is enough for each.

The blood arrested at first may afterwards reappear. Tetu (*Recueil de Méd. et Chir. Milit.*, t. XXII., 3 Nov., 1827) amputated the fore and middle fingers with the corresponding metacarpal bones; in spite of the ligatures the hemorrhage was renewed an hour after, and a ligature upon the deep palmar arch became indispensable. Sometimes hemorrhage takes place from the end of the bone. In a case of this kind A. Petit (*Acad. des Sc., Paris*, 1732, *Mém.*, p. 39) succeeded with lint in the mouth of the vessel. Hevin (*Pathol. et Thérapeut.*, t. II., p. 40) used with advantage a plug of wax. In Loder's case of 19 ligatures, (*Obs. Méd. Chir.*, Jena, 1794, *dans Bibliot. Germ.*, t. II., p. 94,) the blood issued copiously from the medullary canal of the bone of the leg. To arrest it he was obliged to use eau d'arquebusade.

We may be obliged to tie the veins. I have, says M. Champion, had to tie the femoral vein which was throwing out blood in jets, in a case of amputation of the thigh, performed upon a man who had become excessively nervous from fear of the operation, and who, after it was performed, experienced prolonged paroxysms of suffocation. The same thing has occurred to me on three occasions; the ligature of the veins therefore after amputation, as I have already said, does not appear to me so dangerous as has been asserted. [On the method of *tying* arteries, &c., see Dr. Mott's remarks at the conclusion of this section of M. Velpeau's work, *supra*. T.]

## § II.—Disposition of the Wound.

Being now secure against hemorrhage, (vid. Vol. I.,) the surgeon has to attend to the dressing. It is now that the great question of immediate or secondary union presents itself. From the time that Lyon (Alanson, *Manuel Prat. de l'Amput.*, 1765) suggested to Park the idea of bringing the parts in contact upon the centre of the stump, to obtain union by the first intention, and that Alanson brought the practice into vogue; from the time when, in accordance with the English surgeons and the flap method, M. Maunoir made himself the champion of it, immediate reunion has become so generally adopted that it is had recourse to after almost every kind of amputation. But I have elsewhere (see Vol. I.) treated of this subject too much at length, and its advantages and inconveniences, as well as of the different sorts of dres-

sings applicable to amputations, (see same volume,) to make it necessary to recur to it in this place. I shall not, therefore, speak of it again except when treating of each amputation in particular. Surgeons, however, have not confined themselves to the adoption of these different methods separately; it has been proposed by some persons to blend them and to combine many of their stages with the view of profiting of the advantages of some and protecting ourselves from the inconveniences of others.

It is in this manner that O'Halloran (*New Method of Amput.*, 1765,) adopts the following modification, which, in his opinion, ought to conciliate the suffrages of all in favor of Lowdham's mode of amputating. Instead of depending upon compression to suspend the hemorrhage, he advises, like Garengcot, that we should tie the arteries with care, and in order to be sure of having no serious difficulty at the stump, he proposes that the dressings should be flat, that the flap should be left to suppurate for eight or ten days; and that we should then, as soon as it is covered with cellular granulations, raise it up and adjust it properly to the rest of the wound. White (*Cases in Surgery, etc.*, 1770) and Paroisse (*Opuscules de Chir.*, 1806) assert that they have practised this mode in a great number of cases and with the most perfect success. For my own part I am convinced, from the trials I have made of it for the purpose of *secondary immediate union*, that with us it has not been properly appreciated, and that in a great number of cases it possesses incontestible advantages, (see Vol. I.) What O'Halloran added to the process of Lowdham, Bécлар proposed for that of Vermale, when the flaps are formed of tendinous parts, fibrous and synovial sheaths.

#### ARTICLE IV.—CONSECUTIVE TREATMENT.

The patient being carried to his bed must be placed there in a comfortable position; a hoop is made use of to sustain the weight of the bed clothes, and to hinder them from pressing upon the stump, which latter is to be placed gently upon a cushion or upon a sheet folded in the manner of a *fanon* (vid. Vol. I.)

##### § I.—*Position of the Stump.*

It is the practice invariably to have this part slightly raised, in order that the muscles may be relaxed, and also according to some persons for the purpose of counteracting the tendency of the fluids to gravitate towards the wound. There are in fact some advantages from it in this point of view so long as there is no suppuration. But in the contrary case we evidently thereby favor inflammation along the inter-muscular cellular passages, the denudation of the bones, phlebitis, the formation of abscesses and purulent infection. The wisest course therefore is to follow the advice of Hippocrates and Alanson, that is, to leave the stump, should the form of the limb admit of it, upon a horizontal plane, and even to place it upon an inclined one, as soon as the suppuration is about to be established.

§ II.—*Immediate Medication.*

A spoonful or two of pure wine might be proper to relieve the torpor or sinking temporarily produced by the operation; during the remainder of the day we give a few spoonfuls of some anodyne and mild anti-spasmodic potion; and for a drink, infusion of linden, violet, poppy, &c., sweetened with syrup. Except in patients who have been debilitated by long suffering, abstinence at first, in the opinion of most surgeons of Paris, should be rigidly adhered to. According to them, the most that is admissible is a little diluted broth, until the general reaction has taken place. This is a practice which I have renounced for many years past. If the patient has an appetite, and the constitutional reaction is moderate, I give him broths the first day, a potage on the day after, and put him on the fourth part of his usual food on the fourth or fifth day. Unless it be the thigh or leg that has been operated upon, I change the patient as little as possible from his ordinary diet, and treat him as a convalescent.

## § III.

Furthermore, the *regimen* after amputations ought to be the same as after acute diseases, and all the greater operations, (see Vol. I.) If the patient is robust and sanguine, and the operation has been performed for a recent injury, and there has not been much hemorrhage, congestion of the fluids is to be feared, and we may resort to bleeding and depletives. In France, the importance at this time of diminishing the volume of the blood to prevent internal inflammation, and the dangers of general reaction, has been greatly insisted upon. In Germany, England, and America, however, many operators follow an opposite course. Kock, on the very first days, allowed his patients coffee, wine, and even meats. M. Benediet affirms that the bleeding, instead of preventing accidents, favors their development. It is those who are the strongest and are the most sanguine, who best resist, he says, morbid causes, and in whom inflammations are most easily cured. Therefore, the more we debilitate persons amputated upon, and the more they are bled, the more are they disposed to become sick, and the more dangerous and difficult to treat are the inflammations with which they are attacked. The severe dieting and the copious bleedings, prescribed by some persons, and immediately after amputations, only become really serviceable at the moment when incidental diseases and local inflammations make their appearance, (see Vol. I.)

[Dr. F. Pauli, of Leipsic, in his *Untersuchungen und Erfahrungen im Gebeite der Chirurgie*, 1844, makes some valuable observations on amputations, in thirty of which performed by himself, only two patients died. Of these, 12, were of the thigh; 8, of the leg; 4, of the arm; and 6 of the fore-arm. In nervous and excitable patients he has found opium of great service, and a nutritious diet forms an important part of his after treatment.

M. Guersant performs at the *Hôpital des Enfants* some 18 to 20 amputations annually, and it is stated (*Gazette des Hôpitaux*, No. 54,



1851) that 9 out of 10, recover. In 1850, he did not lose a single case. He uses chloroform, and orders a good nutritious diet after the operation. Vid. also, *Am. Journ. Med. Sciences*, Ap. 1852, p. 532.) Mr. James of Exeter, in his remarks on the causes of mortality after amputation of the limbs, to which we have already referred, recommends a generous diet after this operation. His observations upon this point commend themselves to the common sense of every reader. G. C. B.]

#### § IV.

In ordinary cases, the *first dressing* should not take place until at the expiration of seventy-two hours, or of four days, or even sometimes five or six, as recommended by C. Magati and Monro, and as still practised in Spain. In general, patients have much dread of it. Once, in fact, it was to them a formidable affair. No precaution was taken to prevent the adhesions of the lint and compresses to the bottom or sides of the wound. Being performed upon the next or the second day after the operation, and consequently, before suppuration was established, it was calculated to produce such severe pain as to leave an impression upon the minds of the patients as fearful almost as that of the amputation itself. In this respect, patients of the present day are agreeably disappointed. The pieces of linen besmeared with grease, which Brounfield (*Alanson, Man., etc.*, p. 33) was the first to introduce into practice, or the strips spread with cerate always render easy the separation of the other portions of the dressing. At the end of three or four days, the natural moisture and exudations from the wound have destroyed the adhesions which would have necessarily produced some traction, so that the first dressing causes no more pain than the subsequent ones. We should be on our guard, therefore, against imitating those busy-bodies who are found even in hospitals, and who, under the idle pretext of seeing what is going on in the stump, wish to have the dressings removed on the first day. We should not, however, hesitate in removing them if any accidents supervene, such as violent pains in the wound, erysipelas, swelling or hemorrhage. In summer, or when the bandage becomes saturated, and emits much smell, it may also be proper on the first or second days, to remove all the pieces which do not bear directly upon the wound, (see Vol. I.)

In dressing, an assistant takes charge of the stump, which he supports gently with his two hands, taking care not to give it the least sudden movement. The bandage and compresses, impregnated with blood and other fluids, are for the most part, glued together and hardened by drying, to such degree, that their removal sometimes becomes a matter of considerable difficulty. In such cases, if by saturating them with warm water we do not succeed in softening them we must cut off the turns with a scissors. These first pieces being detached, we wet the lint freely with water, and remove only the outer pieces, should they still adhere too firmly. As soon as the wound is uncovered, it should be washed; we do this by squeezing gently warm water upon it, and afterwards cleansing it with fine linen or small balls of lint; after which, the dressing is re-applied as at first, to be repeated every day in the same manner.

If immediate union has been attempted, and no special accident has supervened, we defer to a still longer period this first dressing. Nevertheless, as it is rare that the agglutination at the first is complete at every point, it is likewise a rule to cleanse the stump on the third, fourth or fifth day. If no suppuration makes its appearance, and there should be no reason to believe that there are sinuses forming or appearing, we should avoid meddling with the lips of the wound; at most, it is allowable to remove one of the strips of adhesive plaster to replace it immediately by another. In the contrary case, and when the plasters have become loose, they should be removed in succession, and the purulent and other matters, by means of gentle pressure, be encouraged to make their way outwardly. To detach these strips, they are to be raised successively from their extremities towards the apex of the stump, on which point they are not to be separated until at the end of the dressing; otherwise, were we to take them off from one side to the other without stopping, we should run the risk of destroying the adhesions which at this time are too feeble to sustain the least degree of traction.

#### § V.

The *ligatures* ordinarily do not come away before the eighth or tenth day, and after they have, by means of ulceration, completely cut through the artery they embraced. It would, therefore, be improper to endeavor to force them away at an earlier period. But as soon as they delay coming away beyond that time, there will be some advantage in pulling upon them a little as often as the dressing is removed. Their retention is owing to their having been caught in some sinuosities, or from the knot having imprisoned some fibrous lamellæ as well as the artery. Their separation, moreover, is the more speedy in proportion as their application has been more directly made upon the vessels. Everything induces to the supposition that their presence ceases to be useful after the second or third day, and that there would be no impropriety at this time in disembarassing the wound of them, provided the thing was easy of execution. I have seen them after amputations of the arm or leg, come away on the third or fourth day without any inconvenience. Bonfils, (*Thèse de Strasbourg*,) who maintains that after the sixth day we should hasten their separation, proposes even that we should subject them to a sort of permanent extension; to carry out this object, which MM. Kluge (*Bull. de Fér.*, t. X.) and Law (*Ibid.*, t. XII., p. 234) have proposed to lay down as an axiom, they recommend that the knot should be tied outside and upon pieces of sponge. That we may not have to resort to what J. L. Petit (*Malad. Chir.*, t. III., p. 196) did who was obliged to divide at the bottom of the wound a ligature that did not come away, and in order to avoid, also, drawing forcibly upon them at every dressing, as soon as the inflammation has subsided, as is recommended by Alanson, (*Oper. cit.*, p. 76.) M. Pierron (*Thèse No. XII.*, Paris, 1824) proposes that we should subject them to a permanent torsion, which is to be increased daily; but it is not often that surgeons of the present day require any such means.

## ARTICLE V.—ACCIDENTS.

The accidents which may succeed to amputations of the limbs are important and numerous. Some of them occur at the moment of the operation, and the others at a greater or less distance of time afterwards.

§ I.—*During the Operation.*

A. *Hemorrhage*.—In feeble subjects the loss of blood during the operation is a thing calculated to give rise to serious consequences. It takes place sometimes before we have had an opportunity to tie the vessels, either because the tourniquet has been loosened or displaced, or from the assistant not making the compression properly, or because unexpected difficulties present themselves in seizing hold of the arteries. It is to avoid these difficulties that a suggestion has been made to place a ligature upon the principal artery of the limb before commencing the incision of the soft parts. M. Blandin gives an example of this practice, which is still followed at the Hospital of Beaujon, by M. Marjolin. M. Guthrie and some others have thought it more advisable to tie the arteries in proportion as they are cut. When the ligature is impracticable, our art possesses no other resources than mediate or immediate, and lateral or perpendicular pressure.

[Dr. Sayre amputated the leg of a patient whose femoral artery had been tied by Dr. Mott some 15 years previously. In this case, in consequence of the numerous anastomosing branches which had become developed in consequence of the operation on the femoral artery, *twenty-three* required the ligature. G. C. B.]

But there is *another kind of hemorrhage*, to which these means are not applicable: I mean hemorrhage from the veins, and which, nevertheless, is in some persons exceedingly abundant and sometimes alarming, being produced by the temporary compression preventing the blood from returning to the upper part of the trunk, or caused by some obstruction in the respiration. To arrest it, some persons have proposed to apply a ligature on the principal vein. Monro, Bromfield, Hey, and M. Guthrie are of this opinion. With us, we generally proceed in a different manner. We remove immediately everything which can produce any obstruction in the course of the blood through the limb. The patient is directed to make long inspirations, and the difficulty subsides almost immediately. I have already remarked, that a ligature upon the veins has nothing in it alarming, and that, in persons who have been amputated and who are already too much enfeebled, we must have recourse to it, if the other means do not promptly succeed.

[Dr. Bullen has particularly adverted to the frequent occurrence of venous hemorrhage, in aged people, in whom the lower extremities have been for a long time the seat of chronic inflammation. In such, he remarks, the veins are sometimes very large, and varicose, and after an amputation may give rise to a copious hemorrhage. To restrain this is sometimes a matter of great difficulty, and in addition to the means recommended by our author, he recommends that the limb should



be elevated, and the limb bathed with lotions impregnated with alum. The limb should also be exposed to a current of cold air. T.]

B. The syncope and swoonings which result from the hemorrhage, or the pain, or from the fright which the operation sometimes causes to the patient, require scarcely other than moral means, a spoonful of wine when they are anticipated, cold water, vinegar, or Cologne-water, thrown in the face or held to the nose, and all the other means generally resorted to under such circumstances, and which require no further detail.

C. *Spasms*.—It is not uncommon, immediately after the operation, to see the stump take on a *trembling* which it is difficult to restrain—a sort of convulsive or spasmodic movement, which also requires some attention. Under such circumstances we endeavor, suddenly and as strongly as possible, to divert the attention of the patient, and to inspire him with courage; we make him seize hold of his leg himself at its upper part, or, should it be thought more advisable, cause this to be done by an assistant, with both hands, until the dressing is finished. In general, this symptom continues but a short time, and disappears in a few minutes. It is generally relieved by compressing the muscles with force upon two different circles of the stump. Nevertheless, if it should seem disposed to continue, the stump, as soon as the patient is in bed, should be secured by a sheet or by a napkin, folded in the manner of a cravat. It is then also that some of the preparations of opium are particularly indicated.

D. After being placed in bed, some patients complain of acute pain. This pain, which in some is nothing more than the smarting of the wound, which subsides in a few hours, is increased in others so as to cause them to cry out, and to be under strong nervous excitement. We should then saturate the dressings with narcotic liquids; for example, decoction of marsh-mallows with laudanum, giving at the same time powerful doses of opium internally. When patients refer their pain, as is very common, to the limb they have lost, we must recur to the same treatment; but we must expect to see this symptom return for a long time, and even after the entire cure of the wound.

## § II.—After the Operation.

A. The accident, which still engages our attention the most after an operation, is hemorrhage, which is sometimes caused by our not having tied some of the more important arteries, or by some of the ligatures having become loose, or, more frequently than is thought, by a kind of irritative exudation going on from the surfaces of the wound. After the third or fourth day is passed, it is rare to have any other hemorrhage than this, unless the threads have too rapidly cut through the arteries by ulceration, or that there exists that remarkable condition of the system which Otto, Buel, Krimer, (Malle, *Thèse de Conc.*, 1836, p. 36,) Lobstein, (*Anat. Pathol.*, t. I., p. 211) and so many others, have related examples of, and the peculiarity of which is, that the most trifling incision is followed by an incessant hemorrhage. Why hemorrhage should occur after the eighth or tenth day, it is difficult to say. Petit, Bromfield, Guthrie, and other practitioners, however, have seen it occur at the expiration of three weeks, a month, or even later. In

one of my patients, after amputation of the thigh, it came on after the twenty-third day. The case is related of a patient operated upon by M. Roux, (*Dict. de Méd. et Chir. Prat.*, t. II., p. 213,) in which it did not appear until at the end of two months. The inflammation, which may seize upon the coats of the vessels in the deep-seated tissues of the stump, and the suppuration which surrounds them at the bottom of fistulous passages, can alone account for this species of perforation. Hey and Hennen maintain that consecutive hemorrhage frequently proceeds from the retracted skin strangulating circularly the subjacent tissues, and especially the venous canals; and that it is from this last mentioned class of vessels that the blood comes. This opinion, in my view, appears to be far from being well-founded. When the blood escapes from the veins, it is to be much more frequently imputed, as Pouteau remarks, to too unequal or powerful a compression made by the bandage upon the stump, than to the retraction of the skin; in that case, it is only necessary to remove the dressing and re-apply it more methodically, and the hemorrhage ceases immediately. Another species of hemorrhage, which appears to have been first indicated by M. Gouraud, is that which comes from the bones in consequence of their being in a state of necrosis; at every moment the blood is observed rising up between the living and dead tissue; compression, plugging, nothing stops it—nothing but the exsection of the altered part can subdue it. The swelling of the stump, attended with a considerable degree of inflammation, causes a hemorrhage, which may be suppressed in various ways: 1st, By saturating all the dressings with cold water, which is to be frequently renewed; 2d, By applying the tourniquet or garrote permanently upon the principal artery of the limb.

[Dr. Tripler, of the United States army has reported in the *New-York Journal of Medicine*, July, 1849, a case of secondary hemorrhage after amputation of the shoulder-joint which was successfully treated by a compress and roller to the wound. Dr. Campbell, of Montreal, relates in the *Medical Chronicle*, July 1853, a case of secondary hemorrhage after amputation at the shoulder-joint which was arrested by compression at a distance from the bleeding point upon its cardiac aspect. The following details of this case are of interest:

“Every thing progressed favourably till the 14th day, the wound having almost completely united, excepting for about an inch near its centre, where the ligature from the axillary passed out. On the afternoon of this day an alarming hemorrhage occurred. The gush was sudden, and the stream large, and it certainly would have proved rapidly fatal, had not pressure been promptly applied by Mr. Sinclair, the acting apothecary; as it was, several pounds of blood were lost. At a consultation of the staff of the hospital, it was determined instead of performing deligation of the subclavian at the outer border of the scalenus anticus muscle, or opening up the wound and attempting to secure the bleeding axillary, to try the effects of compression with the horse-shoe tourniquet of Signorini. From the tilting upwards of the clavicle, the anterior pad of the instrument was placed below that bone over the spot where the subclavian was felt pulsating upon the first rib, the posterior pad being applied to the dorsum of the scapula. From the tendency to slip upwards, it was found very difficult to keep the

instrument in its position ; but with the assistance of the pupils attending the hospital, compression was maintained pretty steadily for five days, and then suspended, as it became irksome to the patient, and all tendency to hemorrhage seemed to have ceased. This state of affairs continued till the 21st day, in spite of the frequent disturbance occasioned by a diarrhoea, which had troubled the patient more or less for a week previously, and which was found very unyielding to treatment. At 9 P. M. on the evening of that day, arterial hemorrhage again broke out. while the patient was in the act of describing a peculiar sensation which he then experienced, and which had also preceded the former attack, as if something fluid was trickling from the shoulder to the points of the fingers ; only a few ounces of blood were lost, as the house surgeon, Dr. Reddy, immediately reapplied the compressor, with a broad leather pad under the posterior limb of the instrument, to diffuse the pressure over a large surface, and a bandage which retained it securely in its place. The compressor was worn after the occurrence of the second hemorrhage for three weeks, until the ligature had come away, and the stump had completely cicatrized. The pressure was borne with great fortitude by the patient, who left the hospital about two months after his admission, perfectly restored to health, and has continued free from any return of the disease up to the present time." G. C. B.]

After having found all these means fail, whatever may be the cause of the hemorrhage, we may undress the wound and proceed in search of the bleeding vessel. As it is rare, in consequence of the changes which have been effected throughout the whole extent of the wound, after the first twenty-four hours are passed, that this last-mentioned means would succeed, we have then no other resource than to apply the agarie or sponge, as recommended by White and Brossard, upon the point from whence the blood issues, to *tampone* (*i. e.* to plug) the wound, in whatever way it may be done, till the hemorrhage is arrested, to make use of the apparatus invented by Petit, or to have recourse to direct compression upon the gaping vessel, by means of small plugs of linen or lint, sprinkled with rosin, and held on by the fingers of assistants, who are to be relieved successively for several days ; or we shall have to establish a sufficient degree of compression upon the track of the artery above the stump, by one of the means which I have elsewhere described, (see vol. I. and the present volume.) In a case where the arteries were ossified, (*Acad. des Sc.*, 1732, p. 536,) it was found necessary to make compression in this manner for the space of four days. In a patient, however, who, after amputation of the leg, was attacked with repeated hemorrhages after the thirteenth day, I succeeded, by means of the tourniquet of Petit, applied to the thigh for the space of three days.

A last resource, should it be practicable, consists in *laying bare the principal artery* and tying it above the wound. M. Roux, Dupuytren, Delpech, Sommé and Ghidella have done this successfully. M. Arnal has given a recent instance of this kind, and I have in citing these cases also related others, (see this present volume.) J. L. Petit would have made trial of it, had not the debility of his noble patient deterred him, (*Malad. Chirurg.*, t. III., p. 164.) Pelletan (*Clin. Chir.*, t. II., p. 275) moreover formally recommends it, and I cannot perceive how Du-



puytren, M. Roux, Delpech or M. Guthrie can claim this suggestion for others. It is after all a means which may fail like the others. In a case, related by M. Blandin, and in some others mentioned by M. Guthrie, this ligature applied as it is after the manner of Anel, did not prevent the flow of blood or ultimately save the patients from death. If the vessel which bleeds should be surrounded with soft parts we could also circumscribe it with a stroke of the bistoury at the bottom of the wound, and by passing a ligature upon this groove immediately close the vessel, as was once practised with success by M. Sanson, (*Thèse de conc.*, etc., 1836.) We should do wrong, however, to rank among hæmorrhages that oozing which, upon the first or second day, rarely fails to wet and soil the dressings and linens, and sometimes to go through the whole thickness of the cushions. Though it should be pure blood and not bloody serum, we have no reason to be at all under any apprehensions unless the patient has become thereby enfeebled. As a general rule, while the force of the pulse is sustained and the paleness of the face does not increase, cold ablutions and the tourniquet, if any thing at all be required, will be found quite sufficient.

[Mr. Guthrie's immense experience as a military surgeon gives to his remarks upon this subject the most weighty authority. The success, however, which followed compression in the hands of Drs. Tripler and Campbell, shows that ligature of the artery above the bleeding point is not always indispensable, secondary hæmorrhage occurring after amputation at the shoulder joint. We quote from Mr. Guthrie's *Commentaries in Surgery*, p. 64, the following instructions:

"In the irritable and sloughing state of stump alluded to, hæmorrhages frequently take place from the small branches, or from the main trunks of the arteries, in consequence of ulceration; and it is not always easy to discover the bleeding vessel, or when discovered to secure it on the face of the stump; for as the ulcerative process has not ceased, and the end of the artery which is to be secured is not sound, no healthy action can take place, the ligature very soon cuts its way through, and the hæmorrhage returns as violently as before, or some other branch gives away; and under this succession of ligatures and hæmorrhages the patient dies.

"Some surgeons have in such cases, preferred cutting down upon the principal artery of the limb, in preference to performing another amputation, even when it is practicable; and they have sometimes succeeded in restraining the hæmorrhage for a sufficient length of time to allow the stump to resume a more healthy action. This operation, although successful in some cases, will generally fail, and particularly if absolute rest cannot be obtained, when amputation will become necessary. The same objection of want of success may be made to amputation; and on a due comparison of the whole of the attending circumstances, the operation of tying the artery in most cases is to be preferred in the first instance, and if that prove unsuccessful, then recourse is to be had to amputation; but this practice is by no means to be followed indiscriminately. The artery ought to be secured with reference to the mode of operating, as in aneurism, but the doctrines of this disease are not to be applied to it, because it is still a wounded vessel with an external opening.

"To obviate all difficulties, the part from which the bleeding comes should be well studied, and the shortest distance from the stump carefully noted at which compression on the artery commands the bleeding; and at this spot the ligature should be applied, provided it is not within the sphere of the inflammation of the stump. In case the hæmorrhage should only be restrained by pressure above the origin of the profunda, and repeated attempts to secure the vessel on the surface of the stump have failed, amputation is preferable when the strength of the patient will bear it, to tying the artery in the groin.

"When hæmorrhage takes place after amputation at the shoulder-joint, it is a most dangerous occurrence. An incision should then be made through the integuments and *across* the great pectoral muscle, when the artery may be readily exposed, and a ligature placed upon it without difficulty anywhere below the clavicle.

"If the state of the stump in any of these cases depend upon the bad air of the hospital, the patient had better be exposed to the inclemency of the weather rather than be allowed to remain in it.

"In crowded hospitals, hæmorrhages from the face of an irritable stump are not unfrequent, and often cause a great deal of trouble and distress. It is not a direct bleeding from a vessel of sufficient size to be discovered and secured, but an oozing from some part of the exposed granulations, which are soft, pale and flaccid. On making pressure on them, the hæmorrhage ceases, but shortly after re-appears, and even becomes dangerous. This hæmorrhage is usually preceded by pain, heat, and throbbing, in the surface from which it proceeds. There is irritation of the habit generally, and a tendency to direct debility. The proper treatment consists in the removal of the patient to the open air, with an antiphlogistic regimen in the first instance, followed by the use of quinine and acids; cold to the stump, in the shape of pounded ice or iced water; with occasional styptics to suppress the immediate bleeding. Escharotic and stimulating applications should be used with caution."

G. C. B.]

[*B. Conicity of the Stump.*—Since the labors of J. L. Petit and Louis, the cone-shaped form of the stump, an almost inevitable result of the mode of amputating formerly, has become a rare occurrence. By immediate reunion, when that does not fail, we almost constantly prevent it. It rarely occurs now except sometimes after the union by suppuration. Imputable entirely to the retraction of the muscles, it is in the power of the operator to prevent it, unless the cure should be complicated with some unexpected difficulty. The processes of Petit and Brunninghausen, which consist in bringing the skin only upon the stump, are deemed less efficacious than those of Louis, Alanson, Desault and Dupuytren, or than all in fact which consist in cutting the muscles adherent to the bone much higher up than the free muscles, but this is a question for future consideration. On this subject we must not forget that the muscles retract in some persons much more than in others, and much more so in proportion as their fibres are longer, or have been farther divided from their point of origin, or are more irritated, or slower in uniting and incorporating with the cicatrix; nor must we moreover confound their primitive with their secondary retraction. The shortening which immediately succeeds their section, is not in fact

the only one that takes place; we often see the muscles, especially in patients possessing much strength and embonpoint at the time of the operation, but who become debilitated soon after; we often, I repeat, see the muscles draw themselves to a great distance within their sheaths, abandon the bones which they at first completely covered, thus rendering conical a stump which at the first dressing had the very largest kind of excavation. One of the means which contributes most to prevent this accident, is the care which the surgeon takes at each dressing to adjust the bone accurately to the centre of the stump. In this respect the flap operation has the objectionable inconvenience of favoring the slipping of the parts towards one of the angles of the wound. It is therefore then a matter of much importance to preserve a sufficiency of tissues in that part towards which the bone has a natural tendency to incline, either by means of the action of the muscles or the habitual direction of the stump.

After the operation we counteract the retraction of the muscles, by applying to the stump the moderately compressing bandage of the ancients, as modified by Aitken, (*Essays on several important subjects in surgery*, 1771,) Alanson, Louis, and M. Richerand; arranging it in such manner, that instead of pushing the flesh backwards, like the capeline censured by Decourelles, (*Man. des Operat.*, p. 372,) all the portions of the dressing on the contrary concur in bringing it forward; we are also to dress the wound as lightly as possible, avoiding every thing which can irritate it, or cause it to suppurate or retard its union; adjusting the stump in such manner that it may constantly repose between flexion and extension, and all its muscles remain in a state of relaxation. The projection of the bone, however, is to be apprehended notwithstanding all this, should the periosteum proceed to suppuration, and the pus detach the muscles of the stump, or if any serious affection should in the first eight days after the operation take such hold of the system as materially to interfere with the healing process going on in the wound.

C. *Protrusion of the bone.*—The protrusion of the bone after amputations, whatever may be the cause, is always a grievous inconvenience. When it is slight and simple and without denudation we should not, M. Gouraud says, meddle with it. Nature will elaborate her work in ultimately removing the cicatrix by bringing the skin over the apex of the stump. If the patient is corpulent he will often find that this concavity will partially disappear, and present no obstacle to the employment of an artificial limb. When it exists to a greater degree, there is nothing but the natural exfoliation or exsection which can give relief.

I. *Spontaneous Separation.*—If the bone is not denuded, necrosis will not take place; and we should be in an error to wait for its exfoliation, as advised by Lassus, (*Trad. des Fract. de Pott*, p. 181, 2<sup>e</sup> edit.) Paré, therefore, who made use of excision, was right, (*Lib. XII.*, chap. 35.) Unless this were done, the osseous cone would, in the thigh especially, be in the way in applying an artificial leg, as in the cases mentioned by Veyret and Alanson, (*Opér. cit.*, p. 49, 50, 192, obs. 20,) and as I have also myself seen. This projection of the bone, moreover, is the cause of incurable ulcerations. The soldier mentioned by Salmon, (*De Art. Amp. rar. adm.*, § 9, sect. 2,) and who had both his arms



amputated, is an example of this, to which I could myself add a multitude of others.

The articular extremities take a longer time to exfoliate than the body of the bones; thus Smucker (*Bibl. Chir. du Nord*, p. 57) was obliged to excise them in a patient whom he had amputated at the wrist. In a similar case, Reisenbach (*Trad. par Masuyer*, t. I., p. 218; *Bibl. du Nord*, p. 82) felt himself obliged to remove the lower extremity of the radius because it did not seem disposed to exfoliate. The heads of the bones of the metacarpus in a man who had had all the fingers disarticulated, having remained for ten months without exfoliating, I deemed it my duty, in order to secure the closure of the wound, to perform the operation of exsection.

II. *Exfoliation*, which was formerly considered unavoidable after an amputation, is at the present time deemed only an incidental result. As it is extremely tardy in being brought about, requiring thirty, forty, and sixty days, and even three and four months, to be completed, we should not, except in a very small number of cases, leave this process to nature. The red hot iron, chemical caustics, as the nitrate of mercury for example, and which was frequently employed, down to the present times, and even as late as by Sabatier, do not in any degree accelerate it. It is much better to confine ourselves to gentle movements with the forceps, to be repeated at each dressing, and directed upon the pieces of dead bone as soon as they become moveable. It is well to recollect, however, that this eschar sometimes disappears without any apparent exfoliation. An adult whose leg was amputated at the hospital of St. Antoine by Beauchêne, had a necrosis at the angle of the tibia, which we could feel with the probe, the wound closed over it, and at the expiration of a month a small abscess made its appearance; I laid it open, and a limpid, reddish pus flowed out, but there was no more necrosis, and the cavity soon cicatrised permanently. In another case where the whole stump had become involved in suppuration, I had for a long time before my eyes the extremities of the fibula and tibia, of a chalky and slightly yellowish color, rough and sonorous in fact, completely necrosed; gradually they disappeared under the flesh, the cicatrization took place, and in four months the cure was complete. *Bones, then, that have been laid bare by pus, are not absolutely doomed to exfoliation.* I have now seen more than FIFTY cases, in which the bones of the cranium, nose, jaws, fingers, and toes, the fore-arm and leg, and the humerus and thigh, were bathed in pus and divested of their periosteum, and which, nevertheless, recovered without any perceptible exfoliation. [This is a valuable remark of the author, which is fully borne out by the experience of Dr. Mott and most practitioners who have been familiar with syphilitic and mercurio-syphilitic cases, more especially with the latter. We have noticed this fact in an especial manner, at the *Seamen's Retreat Hospital*, in deplorable cases from those murderous, drenching salivations for syphilis, to which sailors are exposed in the hands of advertising empirics, as well as of empirical physicians. In such cases, where the energies of the system have not been too much prostrated, we shall find, by wholesome, generous diet, good air, and the mild alterative treatment with sarsaparilla, and iodine internally, and lotions of chlorine externally, with strict attention to drawing as forcibly together as

possible the lips of the wound, by adhesive plaster, whenever dressed, and which should be as at long intervals as possible,—that the granulations, even on the frontal parts of the cranium where the teguments are so thin, and on the sharp edge of the tibia or ulna, where they are yet thinner, will, as our author has well described it, shoot out gradually over the white, dry, rough, denuded surface of the bone, and finally close the wound perfectly without the slightest perceptible exfoliation, unless the constitution be greatly vitiated and prostrated, or the loss of substance in the soft parts be over the size of an inch in diameter. The word *necrosis*, however, as used by the author, to express this condition of the bone, expresses, as it seems to us, too much; for an actual *death* of the bone cannot, as we conceive, have taken place in these denudations. In fact, the natural, healthy, organic state of the parts, notwithstanding the loss of the periosteum, cannot have been sensibly changed, but the normal action only suspended, and not destroyed. No doubt, in former, as well as in modern times, this curious phenomenon of tenacity in the vital principle, had been noticed, but (though often observed by others) not, as we are aware, correctly described by any one before Prof. Velpeau. T.]

III.—The *exsection of the bones and of the stump*, which caused so warm a debate in the ancient academy of surgery, is described by Sabatier as a simple, easy, and but slightly painful operation; by others as a second amputation, often more dangerous than the first. When it is to be done, we should perform it so high up as not to be obliged to do it again, or endanger another amputation. We may conceive, moreover, that where the integuments and superficial muscles are far removed from the apex of the stump, it cannot fail to be otherwise than painful; while on the other hand, if the saw is to be used only at some lines above the dead parts or portion to be removed, it becomes an operation of the least importance.

After immediate union especially, purulent inflammation, should it supervene, will sometimes attack the periosteum, which will then suppurate and become detached; the bone is then denuded, and soon mortifies, either throughout its whole substance, or only in a more or less considerable portion of it. At other times, the disease begins in the internal texture of the bone, which renders the accident so much the more serious. M. Moulinié has shown me a sequestrum of this kind, of more than six inches in length, and which comprised the entire circumference of the femur. One of those which I took from the humerus was over three inches. The first indication to be attended to in such cases is to dilate and divide, by means of the bistoury, everything which appears to interfere in the least degree with the free egress and discharge of the pus and other morbid matters; after which we should endeavor to limit the extension of the mischief, by applying expulsive compression from the upper part of the limb down to near the wound. We may then wait for the exfoliation. In other cases, after the evil has ceased to extend itself, we have recourse to exsection, or repeat the amputation a little higher up, as in operating for amputation. If all the tissues should be sound, perhaps there would be some advantage in imitating Wiegand, who, in such cases, makes two semilunar, lateral incisions with the convexity downwards, at a certain distance from the borders

of the wound, and of greater or less length, according to the size, and the greater or less degree of conicity in the amputated limb. These incisions which comprise the skin only, or the skin\* and superficial muscles, are made in such a manner as to avoid the vessels upon which a ligature might be rendered necessary. The teguments being thus detached, are then brought up and united in front of the bone by means of adhesive plasters or the suture.

C. *Hospital Gangrene*, frequently among the sequelæ of amputations, is one of the worst complications that can happen. As soon as it has seized upon the stump, or involved the integuments and muscles to a certain extent, and that the bone has become denuded, and topical applications and caustics have been tried in vain, amputation above the neighboring articulation, and if that be not possible, immediately above the limits of the disease, is one of the last resources we have to oppose to it. M. Gouraud obtained many unexpected cures from it, both in the army and at the hospital of Tours, where I myself was an eye-witness to them. Percy, MM. Willaume, and Desruelles, also adopted this practice, and I do not think we should hesitate in following it under the conditions which I have pointed out, that is to say, when, in spite of the cauterization with the nitric acid of mercury, and even with the red-hot iron, the gangrene continues to advance.

[GANGRENE. *Hospital Gangrene*.—The vitiated condition of the atmosphere in crowded hospitals, barracks, on shipboard in transports, camps, &c., depends upon the abstraction of oxygen or rather its displacement by carbonic acid and nitrogen, and the exhalation of various other deleterious gases, &c., from the skin and alvine and urinary excretions, &c. This will not only *predispose to*, but *generate* a new and malignant principle, or *morbific virus* which will manifest itself in fevers of a putrid and ataxic and adynamic type, in the degeneration of ulcers and wounds into hospital *pourriture* or gangrene, and in such degradation or diminution of all the vital forces as to diminish the chances of success in, or give a fatal termination to, diseases or operations of every kind. Thus Sir George Ballingall (*Remarks on Schools of Instruction for Military and Naval Surgeons*, also his *Treatise on Schools of Naval and Military Surgery*, 3d ed., Edinb., 1844) remarks that when military hospitals are over-crowded, too long occupied, or filled with a relay of *fresh cases immediately* after the removal of the old, results the most fatal are the consequence. In March, 1837, after an action, the surgical hospital at San Telmo afforded a striking example of this. "There were thus," says Mr. Allcock, (*London Lancet*, 1840—41,) "1041 patients in the hospital of the legion, calculated to accommodate, with due regard to health, 800; the chief press of the extra numbers fell upon the surgical hospital of San Telmo." The following gives the melancholy result:—Of 17 primary amputations there were only two recoveries; of 4 intermediary, all died; of 3 secondary, only one recovered, making a total of 24 cases of amputation and only three recoveries.

M. Ollivier, of Paris, has satisfactorily established by personal inoculation on himself (See his late work on *Traumatic Gangrene*) what was in our opinion long since familiarly known, that the matter of hospital gangrene is *contagious* and will reproduce itself. *Sponge* has



been, according to Sir Geo. Ballingall, (*Op. cit.*,) ascertained to be a direct vehicle of this contagion, by the careless and culpable use of the same sponge to cleanse the ulcers among the sick of a regiment stationed at Feversham, England, as related by Deputy Inspector Marshall, (*ib.*, and Cormack's *London & Edin. Monthly Jour.*, Dec., 1844, p. 1040.)

Some persons have on this account gone so far as to propose to discard sponge altogether as a detergent, from the difficulty of cleaning it, and this has been actually done in some English hospitals, (Cormack, *ib.*, p. 1041,) and *surgeon's lint* substituted.

We cannot agree with Sir G. Ballingall that *venesection* can ever scarcely be admissible in cases of hospital gangrene; unless it be in very rare instances in young robust subjects in whom the purulent infection has produced such violent perturbation in the cerebral and circulating functions as to have caused for the time being in the early stage a violent inflammatory febrile reaction, spasms, convulsions, local engorgement, &c.

*Bleeding in Mortification.*—There are cases, says Sir B. Brodie, (*Medical Times*, March 1, 1845,) where *bleeding* and purging will arrest the mortification and cure the patient as in robust habits—not so in persons whose constitutions are broken down by mercury, intemperance, &c., with small, weak, frequent pulse, anxious countenance, &c. Thus you find these two classes of patients where a neglected chancre, has resulted in mortification of the penis. In the one where bleeding, not stimulation, is required, an artery perhaps while the physician is hesitating will spontaneously inflame, and after the discharge of a pint of blood an immediate amendment takes place by nature's unaided efforts. T.]

D. The inflammatory enlargement of the stump, sometimes shows itself in the form of simple erysipelas, at other times under the characters of erysipelatous phlegmon. In the first case, if the skin only is affected, the adhesive plasters are frequently the cause of it, either because they have been drawn too tightly over the wound, or because they contain too great a proportion of matters of an irritating quality; we have then nothing more to do than to remove them, and to dress the inflamed surfaces for a few days with emollient cataplasms. In the second case the accident is of a much graver character and merits the most serious attention. The phlegmasia rapidly extends itself; the muscles and skin are soon dissected by the pus; the subcutaneous tissues and the cellular prolongations sometimes go on to mortify and slough off in large masses, an ataxic or adynamic fever supervenes and the patient's life is placed in peril. Union by second intention is not often followed by such accidents; which is one of the strongest objections urged against the rigid partisans of union by the first intention.

As soon as these symptoms become manifested they must be vigorously combated; they are mitigated sometimes by uncovering the whole wound so as to dress it flat, and by applying leeches to the stump and then cataplasms; but when such means are unsuccessful, or when they are too late, I know of nothing more efficacious than deep and numerous incisions. In 1828 I had occasion to use the flap operation for an amputation of the leg. The whole thickness of the stump soon became

the seat of an extensive phlegmasia ; erysipelas and purulent collections already occupied the lower third of the thigh. The stupor and other adynamic symptoms went on with a frightful rapidity. I considered the patient lost beyond all hope. Beauchêne, who thought otherwise, made from eight to ten deep cuts upon different inflamed portions of the skin. From that time the symptoms began to subside and the patient recovered. It is against this erysipelas also with a greyish tint, and which so often terminates in gangrene in persons who have been amputated, that M. Larrey advantageously employs the actual cautery. The hot iron applied with a certain degree of force upon the inflamed surfaces, so as to imitate the branches of the fern or the nerves upon the laurel leaf for example, or other figures, certainly did wonders at the Hospital of the Guard where I have witnessed the most extraordinary results from it.

Suppose the disease should, after having given rise to numerous general phenomena, again become circumscribed to the part, there often results from it that denudation of the bone, and those fistulous burrowings with that conieity of the stump, which can only be cured by a second amputation. "Experience has taught me, says M. Gouraud, that wounded persons sustain amputation of the stump better than that of the limb, and that the success of the former is more probable than that of the latter. Of ten persons upon whom I performed it in 1814 and 1815, nine were cured." Instead of attacking the whole stump, the phlegmasia is limited sometimes to the cellular tissue surrounding the vessels, and especially the sub-cutaneous veins ; there will then soon be found along the track of these canals, small purulent collections and abscesses, which are to be opened in good season, should not antiphlogistic means or compression have prevented their development.

*E. Purulent Infections. Phlebitis.*—The veins often become inflamed, either in themselves alone, or concurrently with the surrounding parts. Here as elsewhere *Phlebitis* is exceedingly dangerous. The symptoms of adynamy, putridity and ataxy that are soon developed, are almost always followed by death ; so that this becomes one of the most formidable of the accidents that can present themselves after amputations. The dangers which it involves, imputed even down to our own times to inflammation propagated up to the heart, depend as I have shown (see Vol. I.) upon a totally different cause. Purulent infection which is so often complicated with phlebitis, is another accident whose dangers are precisely similar. It is true that the researches of M. Monod and M. Reynaud, tend to prove, that the inflammation of the medullary tissue of the bones participates also in the production of those symptoms which are generally ascribed to phlebitis and infection from pus ; but this is a question which requires new investigations, and I am of opinion that on this subject persons have had their minds warped by preconceived theories.

*F. Cystitis.*—We are often, says M. Gouraud, obliged to apply the catheter to persons who have been operated upon, and many observers have made the same remark. Whatever may be the primary cause of it, it is no less certain that cystitis is by no means an unfrequent consequence of amputations, and especially of amputation of the abdominal extremities ; we must be prepared for this inflammation upon the least

appearance of trouble in the urinary passages. It is useless to say that when this affection menaces blisters ought to be proscribed ; but M. Blandin is evidently deceived in imputing it to this therapeutic agent, for it is observed where no preparation of cantharides has been made use of ; as I saw in the case of a woman whose thigh was amputated by M. Roux, in 1826. For more ample details on the accidents we have just enumerated, and upon tetanus and every other disease that can be complicated with the results of amputation, I can refer only to treatises upon pathology properly so called, and to the article (see Vol. I.) upon *operations* in general.

#### ARTICLE VI.—ORGANIC CHANGES PRODUCED BY AMPUTATION.

As has been noticed by all surgeons, very remarkable changes after the removal of a limb, sometimes take place in the person who has been operated upon, changes which relate either to the stump itself or to the constitution in general.

##### § I.—*In the Stump.*

The muscles, vessels, cellular tissue, aponeuroses, tendons and bones themselves, undergo at the place of their section, a transformation of such character, that all their parts are blended together in their union with the cicatrix, and consist at that place only of layers or fibrous cords, more or less dense and more or less distinct ; the stump which had wasted at first, afterwards becomes the seat of a more active nutrition, increases in size, and finally at the expiration of an indefinite period of time, attains in this respect the volume nearly of the root of the other limb.

##### § II.—*In the rest of the System.*

Persons amputated upon, acquire a remarkable embonpoint, and an augmentation of energy in the organs of digestion, circulation and reproduction ; the vital fluids compelled to circulate within narrower limits, increase the activity of all the functions, in the same way as the intensity of a light becomes more and more vivid in proportion as we concentrate its rays. The tendency is to the formation of the sanguine temperament. The salutary efforts of nature to remedy this too great plethora of the system, are manifested according to the age and sex in epistaxies, hemorrhoids, more abundant menstruations, a greater frequency of stools, and more copious perspiration and secretions. Garengcoot therefore advises in order to prevent this plethora and crowding of the blood, that patients who have had a limb amputated, should from time to time be bled, that they should reduce their nourishment one quarter part during the first year, and abstain from violent exercises. A soldier in the army of the Eastern Pyrenees had his two thighs amputated and recovered perfectly. The activity of all the viscera, particularly the stomach, increased to a singular degree. In a short time this man acquired a corpulency the end of which it was impossible to foresee. The stools in fact were nearer together without however any perturbation



of the belly. But the immobility to which this double mutilation subjected him made his plethora itself a disease. A species of carriage was procured. This passive movement did more harm than good, because it favored digestion more than transpiration and the other excretions. This unfortunate person finally sank under the burden of sanguineous plethora. "I have seen hundreds of such cases, says M. Gouraud, and they appear to me every way worthy the attention of physicians." I have myself seen a young soldier in whom it became necessary to amputate in succession a leg and both arms, also an employé in a bureau who had had his thigh taken off, both of whom by the plethora which ensued, fully confirm the observations of this practitioner.

#### ARTICLE VII.—PROGNOSIS OF AMPUTATIONS.

Amputations have always been considered very dangerous, and they are so in reality. Nor can anything be more uncertain than the consequences which may result from them. Welschius (Bonet, *Corps de Méd.*, t. IV., p. 312) says, that out of five persons amputated whom he saw at the Hôtel Dieu, four terminated fatally. Out of twenty-nine operated upon by M. Baudens (*Gaz. Méd. de Paris*, 1838, p. 346, 347,) or his assistants at the expedition to Constantina, twenty-four died, while out of twenty others amputated by M. Pointis (*Ibid.*, p. 448) at Bougie, during the space of four years, not one perished! M. Warren has lost eight out of forty at the Hospital at Boston, while M. Chelius, (*Arch. Gén. de Méd.*, 2e série, t. IX., p. 229,) at Heidelberg, has saved twenty-seven out of twenty-nine. The English surgeons, who maintain that a greater proportion of persons amputated die in France than among them, attribute it to our mode of dressing; but in examining the fact in itself, M. B. Philipps has recently read a paper (1838) at the Med.-Chirurgical Society of London, by which it appears that the mortality in persons amputated is at least as great in England as in France. At La Charité, I have in the course of one year lost but two out of twenty-six. In the preceding year I had lost six out of twenty-one, and in following year I lost four out of nineteen. A young surgeon of Philadelphia maintained that in his country persons do not die from amputations as they do with us. Upon returning to America, he ascertained that six died out of twenty-four. M. Mott writes: "Our amputations at New-York are rarely followed by death; I cannot recall to mind, at present, but four cases of amputation which have thus terminated. I have amputated two legs and a thigh for gangrena senilis, without waiting for the disease to be arrested. The amputation of the thigh, and one of the two amputations of the legs, were followed with success. Union by the first intention more frequently occurs at New York than in France. I have remarked that in America, the inflammation which follows operations is altogether of a healthy character, whilst at Paris there is more irritability than true inflammation. We must ascribe this difference to our climate, and to the constitution of our countrymen. If our operations are followed by more considerable inflammation, and by a more intense fever, our inflammatory diseases are also more acute than those that are observed in France." It is well to remark, that in their communications, MM. Warren, Gibson,

Paul Eve, and some physicians of Philadelphia, hold precisely the same language as M. Mott on this head. A pupil of the Hospital of Lyons considered himself fortunate in saving twelve out of seventeen, and M. Laborie (*Bull. de Thérapeut.*, t. XV., p. 165) eulogizes a kind of dressing by which only four are lost out of every eleven.

An opinion has gained ground among physicians, that in the hospitals of Paris we lose one in every two or three patients; but this is not generally true. As to myself, I have lost but one in every five or six. It is, besides, impossible in this loose way to form a correct opinion of the mortality of amputations. Success or failure in these cases depends more than anything else, upon the nature of the lesion which requires the operation, the accuracy of the diagnosis as to the condition of the viscera, the importance of the limb to be amputated, the circumstances and the precautions connected with the patient, and the hygienic means and consecutive treatment employed; therefore, when patients die, is it *from the amputation*, or *in spite of the amputation*? Other things, moreover, being equal, amputations are more dangerous in hospitals than in private practice, under an extreme than in a mild temperature, during epidemics than in an ordinary healthy condition of the atmosphere, in men than in women, in old men more than in adults, in adults more than in children, in the lower rather than in the upper extremities, and near the trunk more than at a distance from it. I ought also to remark that amputation of the fingers has to me appeared more dangerous than that of the toes, and that the former in itself, is not less hazardous to life than amputation of the arm.

[The favorable influence of our intense summer heats in promoting union by the first intention, was strikingly confirmed to Dr. Mott by what he observed also in Egypt, during his visit to that country. The somewhat similar climate of the valley of the Nile to our own during the summer, and its often long-continued and parching heats, have nevertheless, he observed, a most remarkable and salutary effect in accelerating the cure of all surgical operations by adhesive inflammation—a result favored, also, by the spare sinewy make and dry fibrous temperament of the Arab, resulting from the character of their climate, their food, and their active habits. The same beneficial results which an elevated and dry temperature produces upon the processes of adhesive inflammation, seem to be derived also, says Dr. M., from the tonic power of intense cold during our protracted winters. T.]

[We are indebted to Mr. Samuel Fenwick, Lecturer on Pathological Anatomy at the Newcastle-upon-Tyne School of Medicine and Surgery, for by far the most elaborate papers which have yet appeared on the general mortality of amputations. They may be found in the *Edinburgh Monthly Journal* for October and November, 1847, and January and February 1848. We quote the following table :

TABLE I.

## GENERAL MORTALITY OF AMPUTATIONS OF THE LIMBS.

<i>Hospital or Authority.</i>	<i>Number of Ampu- tations.</i>	<i>Number of Deaths.</i>	<i>Average Mortality.</i>	<i>Period in which Performed.</i>
<i>Civil Practice.</i>				
Liverpool Infirmary,	43	3	1 in 14 33	1834—1836
Liverpool Infirmary—Mr. Halton,			" 11.66	22 years.
Liverpool Northern Hospital,	96	18	" 5.33	1834—1843
Edinburgh Infirmary,	61	31	" 1.96	3½ years.
Glasgow Infirmary,	276	100	" 2.76	1794—1839
Glasgow Infirmary,	155	47	" 3 29	1841—1846
Six Scotch Hospitals,	24	3	" 8	1842
Newcastle Infirmary,	229	54	" 4.24	
Royal Berkshire Hospital,	27	5	" 5.40	1838—1845
Chester Infirmary,	21	9	" 2.23	1838—1841
University College Hospital,	66	10	" 6.60	1835—1841
Guy's Hospital,	36	4	" 9	1843—1845
Great Britain—Mr. Phillips,	233	53	" 4.39	
Collected from various journals—Mr. Phillips,	308	76	" 4.05	
Notes of various surgeons—Mr. Phillips,	107	28	" 3.82	
Various surgeons—Dr. M. Hardy,	364	83	" 4.38	
Total of British Practice,	2046	524	1 in 3.09	
Massachusetts General Hospital,	67	15	1 in 4.46	
Pennsylvania Hospital,	79	22	" 3.59	
America—Mr. Phillips,	95	24	" 3.95	
Total American Practice,	241	61	1 in 3.95	
Germany—Mr. Phillips,	109	26	1 in 4.19	
France—Mr. Phillips,	203	47	" 4.31	
Hotel Dieu,	35	17	" 2.05	1840—1842
Hotel Dieu,	178	104	" 1.71	1836—1842
Hospitals of Paris—Malgaigne,	552	300	" 1.84	1836—1841
Paris—Gendrin,	63	23	" 2.73	1834
Paris—Dupuytren,	59	15	" 3.93	
Total of Continental Practice,	1199	532	1 in 2.25	
Total of Civil Practice.	3486	1117	1 in 3.12	
<i>Military Practice.</i>				
Army at Algiers,	63	17	1 in 3.71	1837—1840
Baron Percy,	92	6	" 15.33	
New Orleans,	52	12	" 4.33	
Naval Action of June 1st, 1794,	60	8	" 7.50	
Bombardment of Algiers,	59	24	" 2.45	
British Army in Peninsula,	842	289	" 2.91	
British Army at Thoulouse,	100	31	" 3.22	
Military Records—Alcock,	74	6	" 12.33	
British Legion,	109	55	" 1 98	
Total of Military Practice,	1451	448	1 in 3.23	
Total of Civil and Military,	4937	1565	1 in 3 15	

Add to this number 151 from the Pennsylvania Hospital, and 154 from the New-York Hospital not included in the above, and we have



5242 cases. Then with 88 additional fatal cases, we have 5242 amputations and 1653 deaths, or 1 in 3.15.

The following is Mr. Fenwick's estimate of the mortality which may be expected in 500 amputations of the limbs, according to the results in the civil hospitals of Great Britain :

	Number of Deaths.	Proportion to total number of Deaths.	Proportion in 500 Am- putations.
Shock, Exhaustion and Delirium,	23	1 in 6	} 27.82
Gangrene of Stump,	7	" 19.71	
Secondary Hemorrhage,	4	" 34.5	
Tetanus,	4	" 34.5	} 3.89
Erysipelas,	6	" 23	
Visceral Inflammation,	21	" 6.57	
Diseased Viscera,	6	" 23	} 80.62
Purulent Deposits,	29	" 4.75	
Phlebitis,	20	" 6.9	
Phlebitis and Purulent Deposites,	5	" 27.6	} 12.07
Diarrhœa and Hectic,	12	" 11.5	
Bed Sores,	1	" 138	
	138		

From the statistics collected from British and Continental hospitals and other authorities, it appears that of 869 amputations of the thigh, 376 were fatal, or 1 in 2.31. Of the leg, in 534 amputations, 209 died, or 1, in 2.55, and at the knee joint, of 10 cases, 8 died, or 1, in 1.25. Of 58 amputations at the shoulder-joint, 27 were fatal, or 1, in 2.14. Of the arm, in 317 cases, 118 died, or 1 in 2.81. In the fore-arm, of 181 cases, 19, died, being 1 in 9.52.

As to the influence of the duration of the disease for which amputation is performed, Mr. Fenwick concludes that so long as the life of the patient is not placed in immediate danger by his disease, we shall best consult his interest by deferring the operation, since, besides giving him a greater chance of a natural recovery, the amputation will be more successful, and less time will be required to heal the wound in case it be eventually required. Age seems to exert an important influence upon the results of an amputation. Whilst most successful when performed for disease on persons between 5 and 20 years of age, the chance of recovery, according to Mr. Fenwick, of those under 5 years of age is comparatively small. After the age of 30, the mortality increases, until the commencement of old age, when the danger usually becomes less. The influence of the season on the results of amputation is shown in the greater mortality which occurs during the months of April, May, and June. The lowest mortality occurred during the summer months.

The influence of anæsthetics on the mortality following amputations has been most ably investigated by Professor Simpson of Edinburgh (*Monthly Journal*, April, 1848.)

He found that 23 in 100 died after amputation of the thigh, leg or arm,

performed upon patients in an anæsthetic state, whilst 29 in every 100 died when not subjected to this influence.

The fourth volume of the *Transactions of the American Medical Association*, contains the Report of a Committee appointed to examine the question of the propriety of using anæsthetics in surgical operations, and in the analysis of this Report made by Dr. Sargeant of Philadelphia, and published in the *American Journal of Medical Sciences*, for April, 1852, we find a different estimate of their value upon the results of amputations. From the statistics of the amputations performed in the Boston, New-York and Philadelphia hospitals he found that the mortality, when performed for injuries, with anæsthetics, was 1 in  $2\frac{1}{3}$ ; for diseases, 1, in  $4\frac{2}{3}$  cases. Without anæsthetics for accidents, 1 in  $3\frac{37}{88}$ ; for diseases, 1 in  $6\frac{1}{4}$ . For further remarks upon this subject we would refer the reader to Dr. Norris' *Statistical Account of the Cases of Amputation performed at the Pennsylvania Hospital* from January 1, 1840, to January 1, 1850, published in the *American Journal of the Medical Sciences*, July, 1854. G. C. B.]

## SECOND PART.

### AMPUTATIONS IN PARTICULAR.

#### CHAPTER I.

##### THE UPPER EXTREMITIES.

The upper extremities, exposed by their uses and their relations with external agents to every kind of injury, frequently require amputation. The principle in regard to them, is to take away from them as little as possible. The small portion which is preserved rarely fails to be still of some service. We thus amputate separately the fingers, the several bones of the metacarpus, the hand alone, the wrist, the fore-arm in its continuity, and at its articulation, the arm at different points of its length, or at its union with the shoulder, or the shoulder itself.

##### ARTICLE I.—PARTIAL AMPUTATION OF THE FINGERS.

The amputation of the fingers, though but slightly mentioned by the ancients, must have been had recourse to by them in a great number of cases, and at the present day is very frequently performed, and in a great variety of modes, whether we limit ourselves to the removal of one of the phalanges only, or take away the whole, whether we amputate in the continuity of the bones, of which they are made up, or prefer doing it at the articulations.

##### § I.—*Anatomy.*

The fingers, composed of three pieces of bone articulated in the two anterior phalanges in the manner of a hinge, and at the metacarpal phalanx by enarthrosis, are, moreover, composed of tendons, fibrous grooves, synovial sheaths, arteries, and nerves of considerable size, and also of a cutaneous covering, distinguished on its anterior surface by remarkable characters. It is upon their palmar face that are found the two flexor tendons and the fibro-synovial groove, in which they glide. One of these tendons is attached at one extremity to the articular projection of the third phalanx, and at the other to the metacarpal phalanx by means of a simple fibrous bridle. The two layers of the other flexor, on the contrary, are attached to the sides of the middle phalanx. As all the flexor tendons are gathered together in the hollow of the hand before they reach the wrist and the fore-arm, nothing can be more dangerous after amputation of the fingers, than inflammation of their sheaths. From their synovial sheath, terminating in a cul-de-sac only, on the anterior surface of the metacarpo-phalangeal articu-



lations of the two or three median fingers, operations performed on the thumb or little finger are thereby rendered yet more dangerous. From the cellular tissue being accumulated in front in form of a cushion, this part is generally selected from whence to obtain soft parts to cover the stump after an operation. From their dorsal surface being more convex, it would be rendered more difficult to cut out in that part a flap of sufficient width and thickness. From the two arteries that run along their sides, lying so close to the bones, compression upon them may, without any difficulty, be substituted for the ligature. The two phalangeal articulations have this about them remarkable, that being supported on their sides by two very strong ligaments, and in front and behind by tendons of considerable strength, they cannot be divided but by means of certain precautions. The pulley which their head terminates in, and the small cavities separated by a crest which are found upon the posterior extremities of these phalanges, are also important, to be noted in enabling us to guide the action of the bistoury with security.

The skin in these parts possesses peculiarities which are of so much the more importance, that these are not ordinarily effaced by its morbid condition. In the midst of a considerable number of folds and wrinkles which are found upon its dorsal surface, there are three which must be particularly recollected. One which is perfectly transverse, corresponds almost always with the line of the articulation; the second, convex behind, lies over the union of the head of the posterior phalanx with its body; while the third, convex forwards, has the same relation to the anterior phalanx. The palmar surface of the articulation of the third phalanx, is directly underneath, or at farthest, at the distance of a line in advance of the transverse groove which is alone found upon the skin at this part. The same may be said of the middle articulation, in respect to the deepest and most clearly defined line in the integuments which surround it. The metacapo-phalangeal articulation, surrounded like the preceding, by two lateral ligaments, and flexor and extensor tendons, has, moreover, in front of it, or upon its sides, the termination of the lumbricales and inter-ossei muscles, and the trunk of the collateral arteries which bifurcates only a short distance further in advance. As it is upon the head of the metacarpus that the phalanx turns, this latter, during flexion, is almost entirely concealed under the former, which alone forms the projection which is seen in the knuckles. These articulations are not upon the same line. The transverse groove on the palm of the hand which corresponds to the articulation of the fore and little finger, is situated many lines farther back than that of the two intermediate fingers. The best mode of striking upon them is to look for them at ten to twelve lines farther back than each inter-digital commissure; by which arrangement, also, the cushion of their palmar surface serves for an excellent flap to cover completely the head of each metacarpal bone when we remove all the fingers.

## § II.—*Amputation.*

In former times, the fingers were always amputated in the continuity of their phalanges. In the time of Fabricius of Hilden, they were re-

moved by a cutting forceps, gouge, chisel, or some other similar instrument, operated upon by strokes of a mallet. At a later period, the saw was substituted for these, which, in addition to their clumsiness, had, says Fabricius of Hilden, (Bonnet, *Corps de Méd.*, p. 516,) the inconvenience of splitting the bones and giving rise usually to very serious consequences. Verduc, Petit, Garengcot, Sharp, and most modern surgeons, opposed this manner of proceeding; so that, for a long time past, amputation of the fingers in the continuity was abandoned. The operation, it is averred, is more difficult, and that the portion of the phalanx which is left can be of no use. Upon this subject, it would seem to me, they have gone too far, and that it is better, as Le Dran (*Operat.*, t. I., p. 308) and MM. Guthrie and S. Cooper think, to saw through the phalanx where it is practicable, than to extirpate it entire: in the fingers there is no part which has not its uses and importance. M. Graefe occasionally has no hesitation in still employing the chisel and hammer, (Rust's *Handb. der Chir.*, t. I., p. 620.) A young military surgeon, M. Moreau (*Gaz Méd de Paris*, 1836, p. 93) has specially pointed out the advantages of amputation in the continuity of the phalanges, and I have often had occasion to confirm in practice the opinion which I first expressed upon this subject.

A. *Amputation in the Continuity*.—We will suppose the disease to be confined to one of the two last articulations. It is clear that we cannot remove it entirely, without dividing the posterior phalanx at a certain distance from the diseased articulation, and that the remainder of the bone cannot fail to prove serviceable to the patient. We may moreover perform this operation, either by the circular or flap method.

I. *Circular Method*.—In the first mode, the integuments are to be divided as near as possible to the part affected; we then push them backwards, in order to divide the tendons and effect the section of the bones by means of a small saw, or, what is better, by a good cutting forceps, at three or four lines farther back than the point where we commenced the incision.

II. *The Flap Method*.—In the second process, we may confine ourselves to a single flap, which it is better to cut in front, or, doing as Heliodorus formerly did, (*Nicet, de Lus quæ Digit. accidunt*, p. 159,) we may, should the soft parts not make it objectionable, make two flaps, giving them a little less length to each. Reunion, also, by the first intention, should be attempted in both cases.

B. *Amputation in the Contiguity*.—I. *Circular Method*.—The skin is divided circularly at three lines in front of the articulation. The assistant pulls it back, in order that we may be enabled to divide the extensor tendon higher up, and enter between the phalanges on their dorsal surface, after having divided the lateral ligaments. It is not until the bistoury comes out on the palmar surface, that the section of the flexor tendons is accomplished.

This process which was followed a long time ago, described by Garengcot, and recommended by Sharp, Bertrandi, (*Opérat. de Chir.*, p. 504,) Leblanc, (*Opérat.*, t. I., p. 308,) and Lassus, *Méd. Opér.*, p. 545,) and which has been generally adopted in England, is quite as good as any other, and allows of a ready facility of union by the first intention.

II. *Flap Method.*—*A Process of Garengot.*—*Flaps of the same length, one dorsal, the other palmar.* Garengot, (*Opér. de Chir.*, t. III., p. 436) recommends that we should adopt for amputation of the fingers the method of Ravaton, or what is better that of Heliodorus; that is to say, that we should make two lateral incisions united in front by a circular incision; that we should dissect off the two flaps thus made and raise them up to a level with the articulation before dividing that, and that we should then unite them by first intention.

*b. Process of Ledran,* (*Opérat.*, p. 576.)—*Two flaps, one to the right, the other to the left.*—In the place of making two flaps, one in front and the other behind, Le Dran makes them on the side, and gives them a semi-lunar form; this is the process lately described anew by M. Maingault, and very properly condemned by M. Blandin.

*c. Process of Laroche* (*Encyclop. Méth.*, part Chir., t. I., p. 108,) or of Loder, (*Rust's Handbuch der Chir.*, t. I., p. 635,) attributed to M. Lisfranc.—*A Palmar Flap only.*—The skin is divided at about the distance of a line in front of the transverse fold on the dorsum of the finger in order to be enabled to penetrate the articulation at the first stroke. The lateral ligaments are also immediately divided by inclining the bistoury first to one side then to the other. The articulation being completely separated, we have nothing more to do than to cut out a palmar flap of sufficient length to close the wound perfectly. The operation by this mode is performed in an instant. The cicatrix being turned towards the dorsal surface of the finger is, it is said, more favorably situated than when in front; a very questionable advantage certainly, and one that is more than counterbalanced by the risk of having the phalanx denuded posteriorly. Besides the disease does not by any means always permit us to obtain a flap of sufficient length.

*d. Process of M. Lisfranc.*—The diseased finger is placed in supination; the bistoury is inserted transversely and flatwise in front of the palmar line, between the soft parts and the phalanx, the palmar surface of which is grazed in order to obtain a flap similar to the preceding, and which is then raised up; the joint is then divided from before backwards, without leaving any posterior flap. This process is not as good as the preceding one.

*e. Process described by Laroche,* (*Encyclop. Méth. part. Chir.*, t. I., p. 108,) and adopted by M. Walther, (*Rust's Handb.*, t. I., p. 625). *A dorsal flap only.* When the disease does not admit of our forming a flap in front, (*i. e.*, a palmar flap,) we may divide the skin at one line in advance of the palmar furrow, and thus arriving at the fibrous groove, tendons, articulation and lateral ligaments, finish by forming a flap from the dorsal surface of the finger which has been amputated. The cicatrix being less exposed to view and to the action of external agents, offers, it is seen, some advantage, as Laroche says, (*Encyclop.*, p. 108,) to people of condition; but in persons who work in the fields, it exposes to painful contact with hard bodies, which an infinity of laborers are obliged to seize with the hand. It is therefore from necessity and not from preference when we are obliged to operate in this way.

*f. The Usual Process.*—*Two Flaps.* MM. Richerand, Gouraud, (*Handb. der Chir.*, t. I., p. 625,) &c., recommend making two semilu-



nar flaps, one dorsal and the other palmar, and each from three to four lines in length. This process, modified in the following manner, appears to me to be of a more general application, and fully as secure and as prompt in its execution as any other; I proceed to describe it more particularly:—

*g. Process of M. Rust, (Princip. Opér., etc., p. 84.) The Palmar Flap longer than the other.* The operator seizes the diseased finger and gently flexes it as he draws it towards him, while an assistant supports the upper part of it, flexes the other fingers or separates them from the first, and fixes the entire hand in pronation. He then with a narrow bistoury, held in the first position, passes it from one side to the other through the entire track of the anterior fold of the skin, and cuts out a small semilunar flap, with its convexity towards the nail; the divided teguments are drawn back by an assistant; the bistoury ascending with them, traverses the joint as it divides the extensor tendon, and cutting the lateral ligaments to the right and left, passes between the articulating surfaces, and arrives at the anterior ligament. The surgeon then directs the cutting edge of his instrument forwards to make it glide upon the palmar surface of the phalanx, which he has just disarticulated, and to form a flap of from four to six or eight lines in length.

*h. The anterior (i. e., the palmar) flap is the one to be principally depended upon, though the other is not without its use.* That it may not be too short, and in order that we may at the same time give it the necessary length, I think with Delpech, that it is more prudent before terminating its section, to take the measure of it, so to speak, by raising it upon the articular surface which it is destined to cover. All these processes, however, enable us to obtain our object. The trials I have made of them have convinced me that we may to a certain extent, adopt any of them indifferently; that the preference to be given in such cases, depends much more upon the pathological condition of the parts or the fancy of the surgeon, than upon the absolute value of the operative process.

At all events, the amputation of the phalanges is an easy operation. It is certain, however, when we can control the choice, that the mode I have just described, and that which comes under the circular method, are to be preferred. The others will not be necessary, except where we are obliged from the condition of the soft parts to cut the flap entirely from one only of the two phalangeal surfaces.

*C. Dressing and subsequent Treatment.* The operation having been completed by one process or another, it rarely becomes necessary either to tie or twist the arteries. The blood, after the amputation of the phalanges stops of itself, or by means of gentle pressure. If, however, we should prefer using the ligature, each thread should be afterwards arranged at the corresponding angle of the wound. The two flaps, carefully brought together, are kept in contact by one or two strips of adhesive plaster, which embrace the stump in the form of a noose, and are carried back to the wrist upon its dorsal and palmar surfaces. A perforated linen besmeared with cerate, a little dry lint, a soft compress and a narrow bandage to adjust the whole, complete the dressing. In respect to regimen, a light diet for two or three days, and afterwards nourish-

ment somewhat diminished in quantity and less succulent than usual, are the only restrictions to which the patient is to be subjected.

D. *Accidents.* Provided the patient keeps his hand in a sling, it is not necessary to confine him to his bed, unless accidents should supervene. The best method, however, in these cases, of preventing any complications, or remedying them when they do occur, is to establish a uniform and regular compression, from the fore-arm to the wound, including therein the hand, which is to be well protected on its two surfaces.

If unfortunately, purulent inflammation should seize the stump, we must hasten to remove the bandages, and to substitute emollient cataplasms in their place, and endeavour to check the disease by leeches, mercurial unctions, or even deep incisions. This inflammation, from its propagation along the synovial membranes becomes one of extreme danger, and together with phlebitis renders amputation of the phalanges as formidable almost as that of the arm, especially amputation of the thumb, fore finger, and little finger. As we are not obliged in the last [*i. e.*, the third] phalanx, to open so completely into the tendinous groove, the operation here is attended with much less danger than in the others. I will add that I have in three cases of amputation of the phalanges, obtained complete and immediate union, without any supuration.

## § II.—*Amputation of a whole finger*

Some surgeons, and among others, Lassus, (*Méd. Opér.*; p. 543,) have laid it down as a precept, that when the middle phalanx is diseased, the first should also be removed at the same time; since, say they, this last, when preserved alone, remains immovable, and becomes much more embarrassing than useful. To remedy this inconvenience, which he explains by saying that, after the removal of the second phalanx, the flexor tendons are deprived of every kind of point d'appui, and are incapable of acting on the first phalanx, M. Lisfranc (Coster, *Manuel de Méd. Opér.*, 1823) has conceived the singular idea of making at first one or two incisions in front of the metacarpal phalanx, to traverse in this manner the whole thickness of the soft parts, in order to promote inflammation of the tendons and their previous adhesion to the surrounding tissues; but this would be making two operations instead of one, and as I have said elsewhere, (*Anatom. des Régions*, t. I., 1825, first edition,) and as has been well remarked by M. Scoutetten since, (*Arch. Gén. de Méd.*, t. XIII., p. 54,) the object which M. Lisfranc has in view is naturally accomplished by the fibrous bridle which attaches one of the flexor tendons to the first phalanx of the fingers. Even though this anatomical arrangement should not exist, we should not have to fear the immobility mentioned by Lassus. After the cure, the tendons invariably become fixed to the neighborhood of the cicatrix, if they do not to the bone itself, so that nothing hinders them from flexing or extending the root of the amputated finger. On the other hand, observation proves that these fears are purely theoretical. All the patients I have seen, who have had the two last phalanges removed, have used the first perfectly well, and would have been lothe to have had it sacrificed. It is not

proper, therefore, to amputate the whole of the first phalanx, unless the disease has extended so far as to make it absolutely necessary.

Considering that after the operation the two collateral fingers are found widely separated by the head of the intervening metacarpal bone, Dupuytren preferred amputation of this last bone in its continuity to simple disarticulation of the finger. If the patient incurred no more risk by one mode than the other, or if the head of the metacarpal bone did not ultimately become narrower, (*s'aplatir*), so as to permit a nearer approach of the two neighboring fingers, we might adopt this process which M. Champion and many other modern practitioners have sanctioned, and which the English, M. Larrey says, (*Clin. Chir.*, t. III., p. 609,) employ to prevent inflammation in the fibrous structure of the hand; but this is entirely the reverse, and the surgeon ought not to go beyond the metacarpo-phalangeal articulation, unless he is compelled to do so.

A. *Circular Method*.—The disarticulation of the fingers is performed only by the flap or oval method. The circular, carelessly described and adopted by some authors, by Leblanc (*Précis des Opérat.*, etc., t. I., p. 328,) among others, and recommended also by M. Cornuau, (*Thèse* No. 71, Paris, 1830,) is attended only with inconveniences, and ought to be rejected.

B. *Flap Method*.—I. *Process of Sharp*.—After having made a circular incision upon the root of the finger in front of the commissure, Sharp (*Opérat. de Chir.*, p. 390) proposes that we should make another upon each side in order to form a dorsal, and afterwards a palmar flap, before proceeding to the articulation. This is a mode which is inherently defective, and which no one ought to follow, notwithstanding the modification which Rust (*Handb. der Chir.*, t. I., p. 621) has given to it.

II. *Process of Garengéot*, (*Opérat.*, t. III., p. 431.)—The root of the finger, at first isolated down to the articulation by two lateral or parallel incisions, is afterwards laid bare upon its dorsal surface by a semilunar or transverse incision. There is then nothing left but to divide the extensor tendon and the sides of the capsule, in order to separate the joint and remove the finger, while terminating by the section of the flexor tendons and the skin which covers them. This is the process described by Bertrandi, (*Traité des Opér.*, p. 504,) Leblanc, &c. The one that many moderns have substituted for it differs only in this, that the extremities of the two lateral divisions are made to join upon the dorsal and palmar surfaces of the articulation, in place of being united by a transverse incision.

III. *Process of J. L. Petit*—(*Malad. Chir.*, t. III., p. 208.) The root of the finger, circumscribed by two semicircular incisions which include its commissures and are prolonged obliquely in converging to become united behind on the dorsum and in front of the hand, is first laid bare down to the articulation, which is opened and then separated from one side to the other or from before backwards.

IV. *By Puncture*. In place of dividing from the skin to the bones, as in the preceding mode, we may, as Rossi (*Méd. Opérat.*, t. II., p. 235) proposes, plunge in the bistoury from the dorsal to the palmar surface, in order to cut out successively the two flaps from within out-



wards and from behind forwards, that is, from their base to their apex; but this is a process which has no advantage over the others, and which makes a less regular wound than that of Petit, of which in fact it is only a repetition reversed. M. Plantade (*Thèse de Montpellier*, 1805) proposes, after having formed in this manner the first flap, that we should divide the joint and finish as in the following method, which is somewhat less objectionable.

V. *Process of Ledran*, (*Opérat. de Chir.*, p. 577,) or of *M. Gouraud*, (*Princip. Opér.*, p. 83,) improved by *M. Walther*, (*Rust's Handbuch*, t. I., p. 622,) and attributed to *M. Lisfranc*, (*Malgaigne, Man.*, etc., p. 304.) The assistants seize the hand turned in pronation, and also the sound fingers, holding them apart from the median line while they keep them extended. The operator seizes the diseased finger with his left hand and exerts some movements upon it in order to be the better enabled to identify the articulation. Holding the bistoury in his right hand in the first position he directs its heel upon the dorsum of the articulation, or commences even at four or five lines beyond that, and dividing the skin reaches the middle of the commissure upon one side; depressing the wrist he prolongs the incision in the same direction nearly up to the groove which transversely crosses the palm of the hand in front of the joint. The cutting edge of the instrument is brought back upon the convexity of this semicircular wound, to divide from before backwards the remainder of the soft parts down to the articulation, which is laid open upon the side by turning the edge of the instrument transversely into it as soon as it reaches behind the head of the phalanx; while we are dividing the joint and the aid is drawing the skin gently back towards the wrist to the right or to the left, we reverse the finger as though we were in the act of luxating it. Dividing the extensor and flexor tendons at the moment the assistant is drawing upon the teguments in an opposite direction in order to protect them from the action of the bistoury, the surgeon finishes the operation with a second flap, similar to the first, but cut in the direction from without inwards, and from the metacarpus to the interdigital commissure on the opposite side.

VI. To give greater length to the *flaps*, Garengcot and some others recommend to commence the first and terminate the second flap at some lines in front of the commissures. Others propose that their apex should be cut off square, and not made pointed as they generally are. It has appeared to me that by approximating the root of the fingers with some degree of care, we may very easily bring the two sides of the wound in contact, without having recourse to the above precautions, which however have no other inconvenience than that of exposing the skin to become turned back upon itself and to render the operation somewhat more difficult.

When the first incision is made, it is well, in order to run no risk of going beyond the head of the bone and to avoid all kind of groping in the dark, to search with the fore-finger for the internal tubercle of the phalanx which is to be removed; which is moreover an easy matter, as it is the first projection we meet with behind.

I would recommend that the first incision should be prolonged nearly a half an inch beyond the articulation, because we can then divide

with much greater ease all the fibrous tissues which surround it without interfering with the other lip of the wound, and because we shall be more easily enabled by this means to cut out the other flap in a regular manner.

When we have adopted the precaution of grazing the sides of the phalanx and of not passing beyond the head of the metacarpal bone, the trunk of the collateral arteries will generally be found to have escaped; there are but two vessels which bleed, and which can be tied or twisted if they do not stop of themselves.

The process of Ledran is the most rapid of all, and has no other disadvantage than that of not always allowing us to give the same regularity nor exactly the same form to the last flap as to the first; in this respect the method of Petit is preferable to it, and does not merit the censures which some persons have bestowed upon it.

C. *The Oval Method.*—The hand of the patient, the assistants and the operator are arranged as in the preceding process: we commence also in the same manner.

I. *Process of M. Scoutellen.*—The surgeon seizes the affected finger with his left hand, and gently flexes it while holding it slightly apart from the others, and then commences the incision upon the dorsal surface behind the articulation, with the heel of the bistoury which he gently brings forward to the border of the commissure, and comes round with it upon the palmar surface of the finger, by cutting exactly upon the semicircular line which separates it from the hand, properly so called; arrived at the opposite border, he reconducts the bistoury to the anterior or phalangeal extremity of the wound, and brings it back obliquely to the metacarpus to unite the two extremities of the incision. Without leaving the part to be severed he widens the lips of the wound as much as possible, divides the extensor tendon, then the lateral ligaments, increases the flexion of the finger in drawing upon it as if in order to dislocate it, reaches its palmar surface by passing the bistoury through the articulation, and finishes by dividing the flexor tendons as well as the soft parts which connect the phalanx to the cellular cushion of the hand.

II. In the place of following the palmar groove of the finger, on arriving at its commissure, it is more convenient to make the second incision immediately in the same manner as the first. We then disarticulate, and proceed for the rest of the operation in the mode just described. We have thus circumscribed a V incision, and the wound does not present the form of an oval until after the operation is finished.

III. In the ovalar method we rarely divide the common trunk of the collateral arteries. Provided we have not given too much width to the point of the flap which is to be removed with the finger, [*i. e.*, the point or angle on the dorsal surface of the hand immediately behind the articulation where the two incisions meet, or where they commence, if we adopt the modification of M. Velpeau above. T.] the two lips of the wound may be brought together with ease and reunion effected with more facility and certainty by this than by any other method. It is therefore the process which ought to be generally adopted; and it possesses so much the greater advantage that it does not require the skin to be sound to so great an extent as in the others. The wound which

results from it, leaving the palmar cushion untouched, offers in fact a surface one half less in extent than by the flap method, and its regularity always renders coaptation easy ; but to perform it well, it is necessary to be intimately conversant with the anatomy of the parts, and to have had much practice with the operation, and its repetition on the dead body.

### § III. *Amputation of the four Fingers at one Operation,*

Some ancient authors, with various works on military surgery, and many theses written at the commencement of the present century, show that the amputation of all the fingers at one operation had been already practised. In a case where the fingers of both hands had been mutilated by the bat of a cotton dresser, I had an opportunity of putting in practice at the same time all the known methods, and of obtaining flaps from all the sides of the fingers, either to give length to the stumps, or take advantage of the facilities offered by the soft parts intended for covering the bones. In 1804, I was so fortunate as to have it in my power to prevent amputation at the wrist in a young lady who had all the fingers burnt except the thumb, which remained sound. The cure was protracted, but the results were of immense importance to the patient, (Champion, *Private Communications*.) The cases, however, which demand this kind of operation may be readily conceived without the necessity of pointing them out in detail. The crushing of the parts, a projectile from a cannon, congelation, or any thing which would at once disorganize the four appendages of the hand are of this nature. Nevertheless as the cases are rare, where all the fingers are destroyed up to their metacarpal articulation, and no farther than that point, there must be but few occasions where the operation is called for.

A. The hand and the fore-arm being held in the same manner as for amputating a single finger, the operator having seized hold of the fingers which he is about to remove by placing his left thumb transversely upon their dorsal surface, and his left fingers upon their palmar surface, gently flexes them and directs the assistant to stretch the skin by drawing it backwards ; he then with a straight bistoury makes a transverse incision slightly convex in front, and from six to eight lines below the extremities of the metacarpal bones, taking care to commence at the fore-finger if he is operating on the left hand, and at the little finger if on the right hand. This first incision exposes the extensor tendons in front of the articulations. As soon as the integuments are properly drawn back the surgeon opens into the articulations, and divides their anterior ligament. Nothing more remains for him to do than to pass in front of the head of all the disarticulated phalanges a narrow knife, with which he cuts from behind forward a large semi-elliptical flap, whose limits are naturally marked out by the groove which connects the palmar surface of the fingers with that of the hand. The same knife might serve also for the dorsal incision ; but as it is necessary to pass successively over projections and depressions, the bistoury is much more convenient.

B. In order to prevent the protrusion of the flexor tendons we must divide them upon a line with the articulation before finishing the flap.



For this purpose it would be better, perhaps, after the dorsal incision has been completed, to cut out the palmar flap as M. Caillard (*Thèse* No. 307, Paris, 1833) proposes, before proceeding to the disarticulation. In order to make the circular incision, M. Cornuau (*Thèse* No. 71, Paris, 1830) first incises the entire palmar groove, then proceeds to the dorsal incision and finishes with the disarticulation. This process is as good as any other, no doubt; but in an amputation of this kind the surgeon ought to hold himself in reserve to regulate his conduct by the condition of the parts rather than by what he learns in books.

C. There are eight arteries divided by this operation. As they are bent at an angle upon themselves, in raising the tissues to close the wound, it is not generally necessary to apply the ligature. The palmar flap, usually the only one, and always the longest, has no need of sutures to unite it to the dorsal. Strips of adhesive plaster suffice to keep it firmly attached to the head of the metacarpal bones. Over these we apply a perforated linen, spread with cerate. The whole is then covered with a thin layer of lint, then a soft compress, and some long ones which embrace the stump from before backwards, or obliquely, and in the same direction as the adhesive straps. After having properly padded the palm of the hand, nothing more remains than to support all these pieces by means of a bandage, the turns of which, brought more or less into proximity with each other and drawn tolerably tight, should be extended above the wrist and passed once or twice between the root of the thumb, the remainder of the hand and the free extremity of the stump.

D. The same or nearly the same kind of bandage also will answer after the extirpation of a single finger. Nevertheless we proceed somewhat differently, according as we have preserved flaps or confined ourselves to simple oblique incisions. In the first case, in fact, there is required a narrow strip of adhesive plaster to fasten the two portions of preserved tegument upon the head of the metacarpal bone; while in the other case it is sufficient to pass one crosswise and to approximate the roots of the two collateral fingers, as much as possible by drawing gently upon the bandage as it passes round the borders of the hand. It is the same when we have adopted the oval method.

E. There is no need of remarking that when we wish to amputate two or three adjoining fingers only instead of four, the operation should be conducted upon the same principles, that is, in such manner as to have but one flap for the whole wound instead of disarticulating them by as many separate operations.

#### § IV.—*Accidents.*

However easy or trivial the disarticulation of the fingers may seem, it is nevertheless frequently followed by very serious accidents. A man and a woman, in the year 1825 and 1826, died from this cause in the hospital of Perfectionnement; and a patient upon whom I operated at La Pitié, in 1831, perished in the same way. Among those upon whom I have operated at La Charité, two have died, and it would be no difficult matter to find similar examples elsewhere. It is sufficient to remark that the operation should not be decided upon but with caution, and where absolutely required. Its dangers arise from the extreme fa-

cility and fearful rapidity with which the inflammation, through the medium of the tendinous grooves, (coulisses,) sheaths, and synovial membranes and the exceedingly loose lamellar tissue upon the dorsal and palmar surfaces both of the phalanges and hand, is propagated in the direction of the wrist, attacking at the same time the soft parts, the articulations and the surface of the bones, which in this manner soon become the seat of a suppuration which nothing can arrest.

To dilate the fibrous sheath of each finger amputated, as is recommended by Garengot, (*Opérat. de Chir.*, t. III., p. 432,) J. L. Petit, (*Malad. Chir.*, t. III., p. 208,) and Bertrandi, and as has been again recently advised by M. Barthélemy, (*Journ. Heb. Univ.*, t. XII., p. 429,) would in no manner prevent the development of those formidable phlegmasias, which besides are totally disconnected with every kind of strangulation. M. Champion has on two occasions subdued the inflammatory accidents which supervene after amputation of the fingers, by means of caustic potash applied to the palm of the hand; but when eat-aplasms or the vigorous application of leeches do not arrest their progress in the beginning, there is nothing which can prove really efficacious but numerous and deep incisions. The remedy is painful, undoubtedly, but it is a question of life and death; and every one who has had an opportunity of witnessing their sometimes almost miraculous effects will not hesitate an instant in resorting to them.

## ARTICLE II.—AMPUTATION OF THE METACARPUS.

Like the fingers, the bones of the metacarpus may be amputated in their continuity or at their articulations, and separately or all together; they may also be excised or even extirpated.

### § I.—*In their Continuity.*

Though the case may be rare in which we may have occasion to amputate the first and last bone of the metacarpus in their continuity, it is not so with those which support the fore, middle, and ring finger.

A. *Anatomy.*—The bones of the metacarpus, enlarged at their two extremities, incurvated in front, convex and wider on their dorsal surface, which is covered only by the flattened tendons of the extensor muscles of the fingers, and by cellular tissue, veins and skin, and separated by spaces of less width near the wrist than elsewhere, constitute in their ensemble a sort of grating, protuberant behind, and the concavity of which is occupied by the inter-osseal muscles, the tendons of the flexors, the lumbricales muscles, the two arterial palmar arches of the hand and their branches, the distribution of the median nerve, the muscles of the thenar and hypo-thenar eminences, and the palmar aponeurosis and common integuments. Though scarcely moveable at their posterior articulations, they may however be approximated so as to incline towards each other in front at their digital extremities; from whence it follows that after having sawed obliquely through their middle portion, we are enabled to efface in a great degree the chasm which results from it, and that the deformity produced by this kind of amputation is much less than from the removal of one of the fingers. As their phalangeal extremity

is in a state of epiphysis to the age of six or ten years, we may in children, and if the disease requires it, amputate one or all the fingers, by means of the bistoury. At a later period the saw becomes indispensable.

**B. Operative Process.**—The chisel, gouge and mallet, have, as in amputation of the fingers, been employed though more rarely for the removal of the metacarpal bones.

**I. Partial Amputation.**—In the hand, we must sacrifice nothing unless compelled to do so. (*Progrès de la Chirurgie Militaire*, p. 127,) has often seen, and many times himself performed an amputation of a portion of the hand with success. “We have often,” says M. Larrey, (*Clin. Chir.*, t. III., p. 609,) “not had it in our power to save anything but the thumb alone, or the thumb and little finger, or the two or three last fingers of one hand, but they constitute hooks that are extremely useful to the patient.” In a case where the hand was crushed, M. Champion obliquely divided the four first bones of the metacarpus, after having disarticulated the thumb, and preserved the little finger. “This little finger,” says the author, “performs important services as a hook.

**a. The Ancient Process.**—The parts being arranged, and held as for amputation of a single finger, the operator traverses, at some lines beyond the disease, the whole thickness of the hand from its dorsum to its palmar surface, then directs the point of the bistoury, held in the third position, upon the bone itself perpendicularly; inclines it a little to one side while drawing upon the skin; then straightens it to graze the surface of the bone; approximates it to the median line when its point reaches to the outside, and terminates by cutting towards himself with the entire edge of the instrument as far as to the middle of the corresponding inter-digital commissure. After this first incision, one precisely similar is made upon the opposite side, but in such manner that the two form but one only behind; that is to say, that the thumb and forefinger hold the tissues apart to the left, while the bistoury, carried back to the commencement of the wound, glides from the other side to fall also into the same division in front. We then divide what remains of the soft parts about the bone, by passing around its entire circumference with the point of the instrument. A thin piece of light wood, sheet-lead, or pasteboard, or a thick compress is then inserted deep in the wound, to prevent the saw which must divide the bones, from before backwards by a long bevelled section from wounding the flesh. This bevel in consequence of the kind of motion peculiar to the carpo-metacarpal articulation, must be placed upon the ulnar side for the two last fingers, and on the radial side, on the contrary, for the two first.

When the bistoury has not been carried too far outwardly, the collateral arteries are not usually wounded except at the root of the finger; in the contrary case, we run the risk of wounding their common trunk to the right and left, which, nevertheless, does not generally prevent us from dispensing with the ligature or torsion.

In dressing, it suffices to keep the lips of the wound gently approximated by means of some strips of adhesive plaster applied transversely, and three or four turns of bandage. In trying to obtain a perfect



coaptation, we make traction upon the posterior articulations, but this is calculated to give rise to the train of formidable evils pointed out above. This operation, which is not appreciably more difficult than the disarticulation of a finger, makes a bleeding surface or wound three or four times larger, and necessitates the division of soft parts that are more delicate and far more numerous; so that in this respect, at least, it is certainly much more serious, nor should we have recourse to it unless after ascertaining that the other will not suffice.

b. *New Process*.—I have long substituted the following for the ancient process. An assistant separates the fingers apart, and holds the hand. Embracing the diseased finger with my left hand, I make an incision drawn obliquely from the posterior to the anterior articulation of the metacarpus, so as to go around the entire root of the finger. Setting out from the point where this terminates, another incision on the other side proceeds to join the former at a very acute angle on the back of the hand, as in the ovalar method. I afterwards isolate the bone on its sides and palmar surface, to beyond the diseased portion. I had at first used the rowel-saw to divide from the dorsum to the palm of the hand, but M. Liston's pliers enables us to perform the section with far greater facility. Using this instrument, all the soft parts in the palm of the hand are protected from injury, and the operation is at once easy and rapid. None of the five patients upon whom I have used these pliers have had any accidents follow, and everything shows that the bone thus divided heals as well as after the use of the saw.

This process, should it be generally adopted, will rarely make it necessary to disarticulate the bones of the hand. By this process, the operation performed by M. Simonin, (*Décade Chir.*, 1838, p. 52,) to remove the second bone of the metacarpus, would have been made very easy and very simple. It is, after all, only an improvement of the ovalar method, and especially of the process long since employed under similar circumstances by M. Langenbeck, (*Rust's Handbuch der Chir.*, t. I., p. 641.)

II. *Amputation in mass*.—a. Louis (*Mém de l'Acad. Roy. de Chir.*, t. II., p. 272) made the section of the greater part of the bones of the metacarpus, in such manner as to leave only their posterior portion, in the case of a young girl, who was quite satisfied in having this mere vestige of the hand preserved. It would be better still should their anterior extremity (leur tête) alone be diseased, to divide them all in this manner transversely, rather than to disarticulate them. The operation could not present any great difficulties. A semi-lunar incision, with the convexity anteriorly, would lay bare their dorsal surface; a narrow knife, passed between the bones and the soft parts, from one border of the hand to the other, would form a palmar flap of from twelve to eighteen lines in length; a bistoury would then divest each bone of the tissues that surround it, in order to render the section with the saw more neat and easy.

b. *A Single Palmar Flap*.—In such cases, M. Van Onsenort makes in the palm of the hand, placed in supination, an incision near the fingers, with its convexity anterior, and comprising the entire thickness of the soft parts. From each extremity of this incision, he makes another which is oblique, and which are directed respectively to the

radial and ulnar borders of the wrist. The upper extremity of these are united by a transverse incision, which divides through the whole of the tissues on the dorsum of the metacarpus. We then, by means of a narrow bistoury, isolate the bones from their muscles and periosteum; hold back the divided parts, by means of a retracter bandage with five tails, and then saw through the bones.

c. A *process* much more simple, and one to which, considering all the circumstances, I give the preference, consists, after the dorsal flap is formed, in denuding each bone upon its sides, and then dividing them successively with Liston's pliers, before making the palmar flap.

## § II.—*In the Contiguity.*

A. *Partial Amputation.*—All the bones of the metacarpus may be separately disarticulated and amputated, together with the finger which corresponds to them. This may be done with the whole together, or with the four last only, and by a single stroke. But it is almost exclusively on the first and fifth that disarticulation is performed, since it is more easy to amputate the others in the continuity.

I. *Metacarpal Bone of the Thumb.*—From the mobility of this bone, and its shortness, we rarely think of dividing it by the saw when diseased, but prefer disarticulating it. Nevertheless, if its anterior extremity was alone affected, I see no reason why we should not divide it immediately posterior to this. There can be no particular danger in this operation, which, moreover, would not be difficult, and might be performed either by the flap or circular method, and would differ from amputation of the fingers at the joint in this particular only, that it would require the intervention of a cut of the saw, or a stroke of the cutting pliers, to finish it.

a. *Anatomy.*—The metacarpal bone of the thumb which, upon its dorsum and outside, is scarcely covered except by the skin, and which is concealed in front by the whole thickness of the thenar eminence, presents, near the carpus, relations which it is important should be noted. The articulation of this bone with the trapezium being situated obliquely in relation to a line which would extend to the root of the little finger, and presenting, in some sort, a mixed character between the hinge and enarthrosis, and surrounded with a very loose capsule, may be reached upon all the points of its circumference, but principally as its two posterior or dorsal thirds. The tendons of the extensor ossis metacarpi pollicis, and of the abductor pollicis manus, occupy and support its cutaneous region; while the radial artery passes around its ulnar side in going to the palm of the hand to form the deep-seated palmar arch. As to the tendons of the extensor secundi internodii pollicis, and of the flexor longus pollicis manus, their position in front and behind is too well known to require any particular notice here. We determine the position of the articulation by gliding the forefinger from before backwards, either upon the dorsum or on its sides, as it is immediately behind the first osseous tubercle we encounter.

b. *Operative Process.*—We may disarticulate the first metacarpal bone by a great variety of methods, and with ease in whatever way we do it, provided we possess any address or skill.

I. *Ancient Process.*—If the surgeon is not ambidexter, the hand of the patient should be held in pronation for the left side, and supination for the right; in the contrary case, it is placed in pronation for both sides. While the assistant holds the wrist with one hand, and the root of the four last fingers with the other, the operator seizes hold of the thumb, which he carries into abduction; then directs upon the middle of the commissure the cutting edge of the bistoury, held in the first position, with its point upward; divides with its entire edge the whole thickness of the soft parts, grazing from before backwards the ulnar border of the bone as high up as to the carpus; prolongs from four to six lines towards the wrist the incision of the teguments upon the dorsal and palmar surfaces; opens into the joint by inclining the bistoury outwardly; divides all the fibrous parts with the point rather than with the body of the instrument, in order that he may avoid wounding the skin; reverses the thumb at the same time upon its radial border, luxates it, and after having divided the articulation, cuts the flap from behind forward, grazing the outside of the bone until he reaches to within some lines in front of the metacarpo-phalangeal articulation. To preserve to the flap, especially at its base, the required width and thickness, it is advisable, while cutting through the interosseous space, to incline the handle of the instrument a little towards the hypo-thenar eminence, and to direct its cutting edge towards the pisiform bone, or the ulnar border of the carpal extremity of the radius. In prolonging the wound of the skin to some lines beyond the carpo-metacarpal articulation, we obtain a means of disjuncting the bones with ease, without notching or hacking the margins of the flap which is to cover the wound.

If we have wounded the radial artery itself, we apply the ligature to it. The exact coaptation of the surfaces renders this resource unnecessary, when there have been no other arteries divided but the branches on the thenar eminence. After having applied the adhesive plasters, it is well to place a mass of lint or a graduated compress upon the outer surface of the flap the base of which especially must be strongly pressed against the second metacarpal bone.

2. *Another Process.*—An assistant holds the thumb; the surgeon with the three first fingers of his left hand seizes hold of as much of the soft parts and draws them as far outwardly as possible; plunges in the bistoury by puncture from the dorsal surface of the hand to the palmar surface of the thenar eminence, grazing the radial side of the articulation; cuts out a flap as in the preceding process, reverses it backwards, and causes it to be held up by an assistant; he then himself takes hold of the thumb; causes the lips of the wound to be held apart; divides the joint from without inwards, luxates the bone and brings the bistoury back to terminate the operation at the point where it should have commenced in the other process. As the final result is precisely the same in the two processes, and as it is always less easy to disarticulate by this mode, which as it appears is still followed by M. Walther, (*Rust's Handb. de Chir.*, t. I., p. 642,) we should give the preference to the first.

c. *Process of the Author.*—In the place of making the flap by cutting from within outwards, we may proceed in the opposite direction, that is, commence with the section of the integuments, and reverse it



afterwards by dissecting it from its apex to its base; this would be a more certain means of giving it as much regularity as possible, and the proper dimensions desirable, only that it would require a little more time. In actual practice we obtain in this manner a result infinitely preferable to the processes above described.

4. *New Process*.—I have frequently, in amputating the thumb, adopted the following mode. A dorsal incision carried from the styloid process of the radius to the middle of the commissure between the two first fingers, [*i. e.*, between the two first metacarpal bones. T.] and comprising the teguments, the tendon of the extensor secundi internodii pollicis, with a part of the first inter-osseous muscle, lays bare at first the articulation. While an assistant holds open the lips of the wound, the surgeon divides the ulnar side of the capsule, luxates the bone, and passing the bistoury underneath, separates it from the thenar eminence by cutting the soft parts from behind forwards and from within outwards. The palm of the hand being respected by this mode enables us to give to the flap the form and extent we may require, and without any special obstacles to overcome.

5. *Ovalar Method*.—Lassus, Bécclard, and M. Richerand, have long since described the oval method for the amputation under consideration. The operation is commenced as I have pointed out. The incision passes round the anterior surface of the root of the thumb, [*i. e.*, the palmar,] to ascend upon the outside to its dorsal surface, and unite this second incision to the extremity of the first. In the second stage the point of the bistoury is directed upon the articulation which is divided from its dorsal to its palmar surface; after which nothing remains to be done but to detach the bone from the soft parts which are adherent to it, by gliding the instrument in front of it from behind forwards. By this means we obtain an oval wound which is elongated to a great extent, and the lips of which may be united with the greatest degree of facility, so as to leave between them nothing but a linear cicatrix. It is the best and most simple of all the processes known, but not quite so easy as the preceding, which moreover accomplishes the same results.

II. *The fifth Metacarpal Bone*.—The bone which supports the little finger is disarticulated and removed by the same processes as those described for the thumb. Its articulation with the unciform bone presents this remarkable peculiarity; that it inclines obliquely in the direction of a line which would strike in front of the articulation of the trapezium with the first metacarpal bone, and that it is united to the metacarpal bone which supports the ring finger by an articulation which is nearly flat and by two or three ligamentous bandelettes. This articulation is recognized upon the outside by passing the point of the fore-finger along the dorsal surfaces of the last metacarpal bone, since before reaching the line of the pisiform bone we meet with a slight protuberance, then a small depression which is exactly upon the interline of the articulation.

a. When we follow the ancient process we need have no fear of the bistoury catching as it does in amputating the thumb between the bones of the carpus. We must therefore carry it unreservedly as far as to the unciform bone by grazing the radial surface of the fifth metacarpal, and directing the edge of the instrument towards the median line of the

wrist, so as to preserve almost entire the hypo-thenar eminence. When the inter-metacarpal ligament is divided, the point of the bistoury, which is then to be inclined towards the ulna, readily enters into the articulation. In proportion as the other fibrous tissues are divided, the finger is to be reversed upon its ulnar border, that the instrument may escape from the articulation, to form the base of the flap cutting out the latter from behind forward, and prolonging it beyond the metacarpo-phalangeal articulation, while the little finger in the meanwhile is brought nearly into its natural position.

*b. The second process* in which we commence in forming a flap by plunging through the soft parts from one of the sides of the hypo-thenar eminence to the other, before having separated the fifth from the fourth metacarpal bone, is in this part of more easy and advantageous application than upon the other border of the hand. The soft parts which naturally make a very considerable prominence on the outer part of the bone which we are about to remove, enable us by this means to cut out a thick flap of sufficient width; but the disarticulation is also more difficult than by the preceding mode.

*c. The process which I sometimes employ* for the metacarpal bone of the thumb is not applicable with the same advantage to that of the little finger, where the *ovular method* is evidently preferable. The incision, commencing in front of the styloid process of the ulna, is carried obliquely forward to the root of the little finger, passing round its palmar surface from its ulnar to its radial border. We stop at the commissure in order to re-apply the bistoury at this point in order to prolong the incision backwards to unite it at an acute angle with the beginning of the first incision.

We might, moreover, begin just as well by falling on the commissure between the two last fingers, and terminating with the inner incision. As to the disarticulation, it presents nothing peculiar, and does not require any other notice.

III. *The Middle Metacarpal Bones.*—Without being impracticable, the disarticulation of these three bones is, nevertheless, it must be conceded, much more difficult than that of the two first; also amputation in their continuity is generally preferred to their disarticulation. If, however, we should desire to have recourse to the last, it may be performed either by the flap or ovalar method.

*A. The Flap Method.*—1. *Metacarpal Bone of the Fore-finger.*—The bistoury directed from before backwards, and from the commissure towards the carpus, soon reaches the ligament which unites the metacarpal bone of the fore-finger to that of the middle finger. We then raise the handle to divide the dorsal ligament, and then depress it to cut the palmar; the finger is inclined towards the thumb, the articulation entered, then separated by the point of the instrument, and the operation finally terminated by forming upon the radial side of the bone a flap which is prolonged until it reaches beyond the metacarpo-phalangeal articulation.

2. *Metacarpal Bone of the Middle Finger.*—The bistoury is applied between the two middle fingers. Before proceeding to the disarticulation, the wound must be prolonged in front and behind upon the wrist to the extent of half an inch, slightly approximating to the median

line. This articulation is somewhat oblique in the direction from the ulnar to the radius and from behind, for which reason the operation would be rendered much more difficult if we commenced upon the other side. When the dorsal and palmar ligaments are divided, and when the bone which we are about to remove is separated from the metacarpal of the ring-finger, we act upon its anterior extremity as if for the purpose of luxating it backwards, and then endeavor, while an assistant draws the lips of the wound towards the thumb, to disarticulate its carpal extremity, upon which, moreover, is inserted the tendon of one of the radial extensors of the carpus. This being accomplished, the bistoury is glided with its entire cutting edge along the outer surface of the bone to the commissure of the fore and middle finger.

3. *For the fourth metacarpal bone, (i. e., the metacarpal bone of the ring-finger,)* we must direct the bistoury upon the same space; prolong the incision in the same manner posteriorly, with this difference, however, that it must be inclined towards the ulna; we then separate the two contiguous osseous articulating surfaces, and divide the ligaments as in the preceding mode, calling to mind that the articulation of the metacarpal bone of the ring-finger with the os magnum and the os unciniforme is oblique from without inwards and from before backwards, and that it is also continuous with that of the fifth metacarpal. In traversing the whole palm of the hand by two parallel incisions which are united posteriorly by means of oblique A incisions, M. Rust (*Rust's Handbuch der Chir.*, t. I., p. 653) may perhaps render the operation more easy, but it produces a larger wound, and one which is manifestly more difficult to heal.

B. *The Ovalar Method.*—M. Langenbeck (*Rust's Handb. der Chir.*, t. I., p. 654) was the first who successfully extirpated one of these bones by the ovalar method. The operator divides the integuments on their dorsal surfaces, by commencing at half an inch beyond the carpal articulation; he prolongs his incision to one of the digital commissures, brings it back upon the opposite side by passing around upon the palmar surface of the root of the finger; then unites its two extremities by cutting from before backwards, or from behind forwards, after the same rules on the outer side of the bone which he is about to disarticulate. While an assistant separates as far apart as possible the two lips of the wound, the surgeon, with the point of the bistoury, and without using any force divides in succession the ligaments of the articulation; and with his other hand makes an effort to luxate the bone. When he has finally effected this last result, the bistoury is glided flatwise and horizontally, in order to divide from the carpus to the root of the finger all the soft parts which still adhere to its anterior surface.

M. Simonin, (*Décade Chir.*, 1831, p. 51,) in disarticulating the second bone of the metacarpus, in a patient of his who got well, combined the ovalar with the ancient process. The oval incision being made, this surgeon slit up the palm of the hand, and found more facility by this mode in disarticulating the bone, removing with it the finger at the same time.

B. *Simultaneous Amputation.* When the whole hand is affected in such manner that the carpo-metacarpal articulation remains unimplicated, is it necessary to remove the wrist at the same time with it? To



believe in dogmatic treatises on surgery, there should not be the least doubt upon this subject, or, to speak more correctly, none of them have paid any attention to this question; at the present time, however, this is no longer the practice.

In confining ourselves to the disarticulation of the metacarpal bones, we preserve a greater length to the fore-arm, and a moveable portion of limb, and obtain incontestible advantages for the application of an artificial limb. M. Larrey (*Clin. Chir.*, t. III., p. 609) affirms that military surgeons have long employed this operation. M. Yvan (*Arch. Gén. de Méd.*, t. XIV., p. 293) also says that many of the military patients of the Hotel of the Invalids have undergone this operation, and have done well after it. On the other hand, I find in a thesis supported in 1803, detailed observations upon this subject. In many soldiers of the army of the Rhine, says the author, amputation was performed at the carpo-metacarpal articulation with the view of saving at least the thumb. J. B. J. A. Blandin, (*Thèse*, 1803,) who describes this operation, and censures it, says this kind of disarticulation is very difficult; that in one case purulent collections rendered it necessary at a later period to amputate the arm, and in another the fore-arm, and that both died.

Paroisse (*Opusculs de Chir.*, 1806, p. 218) also in a patient of his, was enabled, by confining himself to the extirpation of the three last bones of the metacarpus, to preserve both the thumb and fore-finger. M. Delatouche, (*Thèse*, Strasbourg, 1814, p. 45—46,) who, in removing the fourth and fifth bone of the hand, was equally fortunate, says, that in fourteen or fifteen cases of this description, he has been enabled by this mode, to save a number of fingers. M. Mornay (*Thèse*, Strasbourg, 1816) maintains the advantage of saving the thumb at least. Troccon, who thought himself the author of this operation, repeated it a great many times upon the dead body, and presented a careful description of it to the Institute, which obtained a somewhat favorable report from Percy and Pelletan. At a later period, M. Maingault, (*Nouv. Méth. pour Amputer la Main*, &c.,) in 1822, endeavored anew to draw attention to it, without mistrusting, as it would seem, that any person had spoken of it before him. Since the treatise of Troccon, M. Gensoul (*Arch. Gén. de Méd.*, t. XIV., p. 293) has performed it with entire success at the Hôtel Dieu, of Lyons, preserving only the thumb. Before him M. Guthrie had amputated the two last fingers and their corresponding metacarpal bone. M. Walther (*Ibid.*, t. XXIV., p. 135) has also performed this operation for the second and third finger in one case, and for the third and fourth in another, (*Graefe und Walther, Journal*, Vol. XII., 1829.) Finally, Troccon advanced the idea that it would be practicable to remove at the same time one or more bones of the first range of the carpus, and M. Benaben (*Revue Médicale*, 1825, t. I., p. 377) undertook to demonstrate the correctness of this opinion by successfully performing amputation upon the scaphoid, the trapezium, and the trapezoid bones, and upon the metacarpal bones of the thumb and fore-finger. Two English (surgeons) also have claimed priority on these different points: the one, M. Sully, avers that in 1807, in a patient who is still living, he removed the last bones of the metacarpus, and also the unciform bone, the pisiform, and the pyra-

midal. The other, M. Radioré, avers, that in an infant of nine years of age, in whom he removed the three middle metacarpal bones and the osmagnum, he preserved only the thumb and little finger.

As often as we can preserve the thumb or any of the fingers, there is no doubt that we ought to adopt the process of these practitioners, and to follow the advice of Troceon and M. Maingault. As a general rule, the carpo-metacarpal disarticulation should be preferred to amputation of the wrist. But it is an operation which exacts practice and an intimate knowledge of anatomy; so that if the surgeon does not feel sufficiently confident of himself to perform it without fear, he ought not to undertake it.

I. *Anatomy*.—We have already spoken of the arrangement of the first and fifth bone of the metacarpus, with the trapezium, and unciform bones. The metacarpal bone of the fore-finger, which is but loosely attached on its outer border to that of the thumb, but more firmly united on its inside with the third metacarpal bone, presents posteriorly on its outer side, a tubercle which is prolonged some lines towards the wrist, and gives attachment to the tendon of the extensor-carpi-radialis-longior, (premier radial.) [For *all* the musees, see Table at the beginning of Vol. I., this American Edition. T.] Its posterior articulating surface is articulated on its outer portion with the trapezium, and on its two inner thirds with the anterior articulating surface of the trapezoid bone, which is found incased there, as it were, in a sort of triangular cavity.

The third bone of the metacarpus also presents a tubercle which projects beyond the interline of the os magnum and the trapezoid bone, upon which tubercle is inserted the tendon of the extensor-carpi-radialis-brevior, (second radial externe.) Its posterior articulating surface, oblique from without inward, rests in almost its whole extent upon the corresponding surface of the os magnum; while the articulating surface of the fourth metacarpal bone, oblique internally and posteriorly, is united with the radial half of the anterior articulating surface of the os unciforme, and then with a similar articulating surface which is presented by the os magnum anteriorly and on its inner side.

All these bones, on their dorsal surface, are kept in contact by ligaments in form of longitudinal and transverse narrow bands, (bandelettes,) and on their palmar surface by ligaments much more irregular in form, and also by fibrous bundles which fill up the spaces which the points of the posterior extremities of these bones leave between them in front. Their synovial sheath is continuous, moreover, with that of the carpus, and is extended consequently between the two ranges of bones of this part; so that inflammation of the osseous surfaces as a consequence of the amputation we have been treating of, must, as a matter of course, be of a very formidable character.

In reviewing all these articulations upon their dorsal surface, we see that that of the first metacarpal, oblique anteriorly and internally, terminates at one or two lines in front of that of the second, the interline of which latter goes at first almost directly backward, becomes nearly transverse before leaving the trapezium, then turns round into a semilunar direction, with its convexity backwards on reaching the trapezoid bone, and afterwards passes again obliquely backwards before abandon-

ing this bone and uniting itself with the third metacarpal. The articulation of the third metacarpal bone commences at half a line nearer the wrist than the extremity of that of the second, and inclines obliquely inwards and forwards, as if to rest upon the posterior fourth of the fifth metacarpal: it terminates, moreover, at two or three lines nearer the fingers than the commencement of the articulation of the fourth, which last at first follows such a direction, that if prolonged, it would become blended (*irait se perdre sur*) with the pisiform bone; afterwards it becomes almost transverse on arriving at the os unciforme, and continuous, but in some sort without any line of demarcation, with that of the last metacarpal, which is also very slightly oblique posteriorly.

The manner of identifying externally the first and fifth of these articulations having been pointed out above, it is, as I conceive, unnecessary, to recur to it here.

II. *Operative Process.*—A. *Method Adopted by the Author.*—An assistant supports the fore-arm, while he makes pressure at the same time upon the radial and ulnar arteries. The hand of the patient, turned in pronation, is embraced by the operator, who confines himself to holding the four last fingers, when he wishes to preserve the thumb; with a straight bistoury, or a small knife, we make a semicircular incision, with its convexity forward, about half an inch in front of the articular line we have just described. The assistant draws the skin back towards the fore-arm. With a second cut of the bistoury, the surgeon divides all the extensor tendons, and proceeds immediately to disarticulate, commencing on the radial side if he operates with the left hand, and on the ulnar side, on the contrary, if he operates on the right. The point of his bistoury should merely be drawn over the whole extent of the dorsal surface of the articular interline, for there is no need of penetrating the joint in order to divide the ligaments. If we begin by the thumb, its cutting edge will be first directed from behind forwards and from without inwards; then almost directly backwards; afterwards transversely, obliquely forward, obliquely backward, then forward again through the whole extent of the articulation of the os magnum, with the third metacarpal bone, very obliquely backward upon arriving at the fourth, almost transversely to separate this last, and in such manner as to follow the same direction for the separation of the fifth metacarpal from the os unciforme. During this manipulation, a certain degree of force is exerted upon the anterior extremity of the hand, as if for the purpose of luxating it.

All the articulations being now laid open, the point of the bistoury is used to complete the section of the fibrous parts which may still hold them together. When these are all completely separated, the knife is glided gradually towards the palm of the hand, and being turned flatwise, cuts out a semilunar flap of an inch or an inch and a half in length, grazing, as it proceeds, the palmar surface of the metacarpal bones which are to be removed. The terminating branches of the radial and ulnar arteries have necessarily been divided. Those of the first are found upon the dorsal surface of the wrist, and near its radial border; the second must be sought on the inner side of the pisiform bone. Immediate reunion, which is in some sort indispensably necessary, requires



here the same precautions as after the simultaneous amputation of the four last fingers.

*b. Process of M. Maingault.*—The process which I have just described after having often made trial of it on the dead body, and which is founded upon the principles laid down by Troccon, is not the same as that of M. Maingault. This last-mentioned author proposes that the surgeon should commence by forming the palmar flap, with a small knife inserted between the bones and the soft parts, so as to pass a little in front of the projections of the unciform and trapezium bones, leaving untouched everything which appertains to the thumb. He afterwards makes a semi-lunar incision upon the dorsal surface of the metacarpus, at the distance of an inch from the articulation; then returns in front, and while an assistant draws the flap backwards, he directs the point of the bistoury upon the base of the first, [flap,] until he exposes the inter-articular line. After which he proceeds to the disarticulation from before backwards, commencing with the metacarpal bone of the little finger, or by that of the fore-finger, according as the operation is upon the right or left hand.

*c.* The trial which I have made of this process has convinced me that it is not in reality very difficult. From not being practised in it, however, or from its inherent defects, it has appeared to me that the other was much more convenient. The definitive result, however, it is seen, must be the same in both cases.

*d.* If the two last metacarpal bones, or the two first, only were to be removed, the operative process would have to undergo some modifications. It would be necessary, in the first case for example, to commence by a transverse incision a little in front of the articulations, then to make another parallel to the axis of the metacarpal bones, upon the dorsum of that which supports the little finger, in order to cut upon that part a dorsal flap, which is to cover the whole ulnar side of the wound after the operation. This being done and the disarticulation completed, we would terminate the operation by forming only a small flap, of one or two inches in length, which we should be obliged to separate down to its base in the palm of the hand, in order to be enabled to raise it in front upon the transverse branch of the wound. We should proceed in the same manner nearly for the removal of the thumb and fore-finger, or for the fore and middle fingers. Proceeding in this manner, M. Gairal, (*Journ. Hebd.*, 1835, t. III., p. 64,) in the case of a man who had a musket burst in his hand, was enabled to preserve the two last fingers. Another patient, operated upon at Nancy (Gairal, *Journ. Hebd.*, 1835, t. III.) by the same process, lost only the three middle metacarpal bones, while he preserved the thumb and little finger.

Should it be required to remove at the same time some of the bones of the carpus, there is no rule that could be laid down in advance; these nice operations must in general be left to the anatomical skill of the surgeon. M. Van Ousenort, in amputating the inner half of the metacarpus, with unciform, pisiform, and pyramidal bones, cut out a single flap only upon the ulnar border of the hand. The patient got well, and preserved the use of his thumb and fore-finger, with the middle finger in a slightly ankylosed state.

## ARTICLE III.—THE WRIST.

In our times, says Percy, it is only at Tunis, or among other barbarians, that they cut off the wrist by means of a large hatchet, driven by a weight falling from above between two grooved uprights, or a heavy chisel, which is struck upon with a leaden hammer. Nor is there any one who any longer believes it necessary to amputate the fore-arm, when, in order to remove the totality of the disease, nothing more is required than to disarticulate the hand. Among the moderns, however, there are many surgeons who regard this last operation as exceedingly dangerous. The facts related by Slotanus, (*F. de Hilden, in Bonet*, p. 504,) Bartholin, (*Hist. Anat.*, cent. 5, hist. 63,) Paignon, (*Mém. de l'Acad. Royale de Chir.*, t. V., p. 504, 1819,) Leblanc, (*Précis des Opérat.*, t. I., p. 317,) Andouillet, (*Acad. de Chir.*, t. V., p. 505,) Hoin, (*Ib.*, p. 506,) Sabatier, (*Ib.*, p. 504,) Brasdor, (*Ib.*, p. 492,) Lassus, (*Méd. Opérat.*, p. 541,) M. Gouraud, (*Princ. Opérat.*, p. 79,) and other surgeons, who affirm that it is almost always successful, have not dispelled the fears which it formerly inspired, and which Schmucker (*Rougemont, Bibl. Ch. du Nord*, t. I., p. 56) still entertains.

## § I.—Anatomy.

The radio-carpal articulation, surrounded with numerous tendons and synovial grooves and membranes, offers, moreover, this remarkable peculiarity: that it is terminated at the extremities of its largest diameter, by the processes of the radius and ulna, which gives it a semilunar form, concave transversely, slightly concave also from before backwards, where is lodged a kind of head formed by the scaphoid, semilunar and trapezium bones, which are kept in place by the internal, external, posterior, and anterior ligaments. As the first range of the bones of the carpus diminishes (*s'amincit*) at its extremities, especially on the ulnar side, a line drawn transversely between the *apices* of the styloid processes, would naturally strike between this range and the second. The pisiform, the point of the scaphoid, the crest of the trapezium, and that of the unciform bone, rise sufficiently above the line of the palmar surface of the radius and ulna, to require also that they should not be overlooked at the moment of operating. The skin on the anterior surface of the wrist presents almost constantly three wrinkles, which may be of some service in regulating the direction of the instruments. One of them, and which is the most constant, is found immediately above the thenar and hypo-thenar eminences, and corresponds to the line of division of the two ranges of the bones of the carpus; the second, which is noticed at four to six lines behind this, is over the line of the radio-carpal articulation, and the third still higher up, corresponds usually with the epiphysal line of the bones of the fore-arm. When these folds are not very obvious, it is ordinarily sufficient to flex the hand moderately to make them distinct.

§ II.—*Operative Process.*

The amputation of the wrist is performed only by the circular and the flap method. Owing to the arrangement of the articular surfaces, and the slight degree of thickness in the soft parts, the oval method is not applicable to this operation.

A. *The Circular Method.*—The surgeons of the last century having contented themselves with remarking that the amputation of the wrist was performed like that of the fore-arm and leg, without entering into any details upon the subject, it is to be inferred that they employed the circular method, described, moreover, with sufficient clearness by J. L. Petit, the only one pointed out by Lassus and Sabatier, and the one, we must confess, which still presents the most advantages and facilities. The assistant who holds the fore-arm, draws the integuments forcibly backwards. The surgeon seizes the hand of the patient, and places it in a state of flexion, while he makes his incision upon the dorsal surface towards the radius on the contrary, when he incises inwardly, and upon the ulna when he reaches the outside, and in extension at the moment the instrument is passing underneath. In this manner he makes a uniformly circular incision, at a large finger's width in front of the processes of the fore-arm, and confines himself at first to the section of the skin which it is easy to push back afterwards to near the joint. A second cut divides all the tendons upon a line with the retracted integuments. We then enter the articulation upon either one or the other side, taking the corresponding styloid process for our guide, and making the bistoury describe a curved line, with the convexity directed posteriorly.

Though the radial and ulnar arteries are readily found, and may be either tied or twisted, they are often left in the wound without this precaution, and without any hemorrhage resulting from it. As to the inter-osseous, it is too small to require the least attention. If the operation has been well performed, there will be found a sufficiency of integuments to enable us to bring them forward without any difficulty, and to cover the articulating surfaces completely. It is in these cases that Garengéot and Louis (Leblanc, *Op. cit.*, t. I., p. 319) advise the division of the tendinous sheaths to the extent of one or two inches, in order to prevent the formation of purulent collections. The inclined position of the stump at least seems, in these cases, to be imperiously demanded.

B. *The Flap Method.*—I. *Ancient Process.*—The army surgeons appear to have for a long time employed, and M. Gouraud in 1815 has described, a process which consists in making, on the dorsal surface of the wrist, a semilunar incision, with its convexity towards the fingers, and whose two extremities seem to be continuous with the styloid processes of the radius and ulna. An assistant then immediately draws back the cutaneous envelope, and the operator divides the bridles which unite it to the subjacent tissues. A second incision, made upon the line of the articulation, serves to divide all the extensor tendons and the posterior radio-carpal ligament. We then divide the lateral ligament and the tendons of the radial muscles, [see vol. I., Table of the Muscles. T.] and of the extensor-carpi-ulnaris, if they have not already been divid-



ed at first. Nothing more remains than to separate the joint with a narrow knife, which is glided in front of the carpus, so as to terminate by cutting out a palmar flap of about an inch in length. Some surgeons recommend giving this flap a length of two inches from its root, and consequently to obtain a portion of it from the thenar and hypo-thenar eminences. Should we have been enabled to preserve a sufficiency of skin in the beginning, this precaution would be more injurious than serviceable. To cut it with facility, and give it all the regularity possible, the cutting edge of the instrument must be inclined in good season towards the integuments, in order not to strike against the osseous projections of the carpus, and that we may remove the pisiform bone at the same time with the hand. Should the flexor tendons, which form in that part a bundle of considerable size, make any resistance, we ought not to hesitate to direct the instrument under them, in order to divide them transversely. The approximation and reunion of the lips of the wound will be thereby rendered more easy.

This process, which is as prompt as it is simple, has the advantage, should the soft parts posteriorly be degenerated, of enabling us to preserve a sufficiency of them in front to cover the whole wound; but it has the disadvantage of endangering denudation of the bony angles and their protrusion between the lips of the wound; for the thickest and widest part of the cutaneous flaps is situated precisely upon the concave and least saillant portion of the articulation.

II. To cut the 2 flaps before opening into the articulation, as has been done by M. Walther, (Rust's *Handb.*, t. I., p. 609,) would perhaps give more regularity to the wound, but would not in any way change the character of the process. M. Rust, (*Ibid.*, p. 610,) who, by means of two lateral and two transverse incisions, gives a square or trapezoidal form to the dorsal flap, which he then raises up to divide the articulation, and to finish as in the ordinary process, has, it appears to me, rendered the operation thereby unnecessarily complicated.

III. *Process of M. Lisfranc.*—The operator, provided with a narrow knife, transfixes the tissues on a line with the styloid processes, from the radius to the ulna or from the ulna to the radius, according as he is operating on the right or left limb; passes in this manner between the soft parts and the anterior surface of the carpus; then brings the instrument in front, and cuts out, as in the preceding case, a semi-elliptical flap of about two inches in length. This flap being raised up, or turned back, enables the surgeon to make, immediately after, upon the dorsal surface of the wrist, a semicircular incision nearly similar to that of the process which I have just described, and at the same time to divide the extensor tendons nearly on a line with the articulation; then to disarticulate by passing under the point of one of the styloid processes; thus terminating the operation as in the circular method.

IV. In describing the process which M. Blandin, (Jadclot, *Jour. Hebdom.*, t. III., p. 460,) on one occasion, adopted with success, the editors of Sabatier have, as it were unconsciously, added to it a slight modification. After having formed the palmar flap, in place of carrying the knife behind the wrist to divide the integuments there, they propose to divide the joint immediately from before backwards, and to finish with the division of the tissues which cover the dorsum of the carpus.

Whether we adopt one mode or the other, this process presents nearly the same advantages and the same inconveniences; that is to say, it is infinitely less convenient than the flap method usually followed, and, moreover, differs from it by such slight modifications as not to require any further notice.

V. The method of Rossi (*Elém. de Méd. Opér.* t. II., p. 233) which proposes to make two flaps, one to the right and the other to the left, in the place of forming them in front and behind, also has no claims to our notice.

VI. At the wrist as elsewhere the surgeon is often guided by the condition of the diseased parts, much more than by the rules established upon the dead body. A man who had the metacarpus and fingers contused by a cotton dresser exhibited upon the palm of his hand a large flap of sound tissues. After having abraded and regularized this flap, M. Champion, who has never had any occasion to regret having preferred extirpation of the wrist to amputating the fore-arm above it, raised it up to its place and effected the cure of his patient. In an army farrier, in whom a cancerous affection extended posteriorly to a line with the articulation, I was obliged to take the flaps from the outside and in front. The patient recovered.

VII. The borders of the wound should be approximated from before backwards. A roller bandage brought down from the elbow to the wrist, and long compresses for each side of the stump, protect the synovial membranes from inflammation and purulent collections. A slightly depending position best suits the wound. If any inflammatory engorgement should take place in the stump we must hasten to remove the bandages, and to substitute emollient topical applications, and antiphlogistic to the agglutinating means.

#### ARTICLE IV.—THE FORE-ARM.

The law that we should amputate as far from the trunk as possible, and save as much and take away as little of the parts as we can, and which is applicable to all amputations of the upper extremity, is more especially so to that of the fore-arm. J. L. Petit, (*Malad. Chir.*, t. III., p. 207,) Garengéot, (*Opérat. de Chir.*, t. III., p. 444, 2e édit.,) Bertrandi, (*Opérat. de Chir.*, p. 471,) and more recently M. Larrey, (*Clin. Chir.*, t. III., p. 603,) influenced by false appearances or erroneously reported facts, have, notwithstanding, taken opposite ground. According to them, the lower third of the fore-arm is not sufficiently provided with soft parts, and has too many fibrous tissues to enable us to cover the bones conveniently after amputation, or to secure us against the thousand dangers from operations in this region. Its upper half, on the contrary, provided with numerous muscles, and having but few tendons, presents the conditions the most favorable for the success of such operations, and ought consequently to be selected by preference at the expense of sacrificing some inches of tissues that might if necessary have been saved. To this reasoning we may reply, that even the thinnest part of the fore-arm, and which is the most completely destitute of muscular fibres, will always enable us to preserve a sufficiency of skin to unite immediately and close the wound; that in point of fact it is always

the integuments which form the cicatrices, and that these integuments are at the same time so much the more preferable and more supple and solid, where there is the least quantity of muscle and tendon. It is a point, moreover, which experience seems to have now definitively settled, for I meet with no one who desires to make it a subject of controversy.

### § I.—*Amputation in the Continuity.*

The fore-arm, besides its 20 muscles, and their tendons, the radial, ulnar and inter-ossæal arteries, their corresponding nerves, and the median nerve, and the aponeurosis, and the superficial veins which are distributed over its whole extent, presents also for consideration, 1, Its two bones moveable upon one another, and separated by a space which narrows as their extremities approximate, and which by means of a sort of [intervening] membranous diaphragm form the floor for the anterior and posterior inter-osseous cavities and fossæ; 2, A series of decussating fibres and of abundant lamellar tissue between the different fleshy layers, whose intimate connections allow of but very little retraction, at the same time that the ensemble of these parts is as favorable as possible to the development of phlegmonous inflammations and purulent collections.

A. *Circular Method.*—All the processes of the circular method, as that of Celsus, the one by Wiseman and Pigray, those of Petit, Le Dran, Louis, Alanson or Desault, are those that have been most usually employed in amputation of the fore-arm. The most generally followed, however, at the present time, and the one which I think the best, is performed in the following manner:—

I. *Process adopted by the Author.*—An assistant placed upon the outside of the shoulder of the patient, who is supported upon the side of his bed, or seated upon a chair if he is not too weak, compresses the brachial artery against the humerus below the axilla, (See this volume, supra.) A second assistant, or the same one if we cannot procure another, seizes hold of the fore-arm turned in pronation, and holds himself prepared to draw back the skin towards the elbow. The limb which is to be amputated should at the same time be enveloped in linen and supported by a third assistant.

a. *First Stage.*—The operator, seated upon the inside, seizes with his left hand the fore-arm above the point where the skin is to be divided, if he is on the left side, and under it on the contrary, unless he is ambidexter, where he is to amputate the right fore-arm, and then makes a circular incision upon the integuments down to the aponeurosis, and at the distance of two or three fingers' breadth below the place where he intends to make the section of the bones. Should any cellulo-fibrous bridles interfere with the retraction of the teguments he rapidly divides them, and immediately bringing back the knife upon the outer and posterior surface of the radius, he makes a circular incision as at first, cuts through the whole thickness of the flesh as near as possible to the skin, first upon the dorsal region, then upon the palmar, and lastly upon the radial. In order that the soft parts may not shrink or retract, instead of submitting to the action of the knife, it is necessary to effect their division by a saw-like movement of the instrument, which should not quit



the surface of the radius before resting fully against the ulna, keeping the edge close to the surface of the latter bone as the incision is brought round upon the palmar surface, if we do not wish any part to escape or recede posteriorly. I have no need of adding that the same precaution is equally necessary for the remainder of the circumference of the limb.

*b. Second Stage.*—The divided muscles retract to a greater or less extent. The knife is now directed behind upon the dorsal surface of the ulna, and while the surgeon draws the instrument towards himself, its point as it proceeds falls upon the posterior inter-osseous fossa which it traverses to its depth, and divides, as it returns and comes round upon the posterior surface of the radius, every thing which it meets in its progress. It is now replaced underneath to complete in front what it had just effected behind, after which nothing more remains undivided around the bones.

*c. Third Stage.*—The middle tail of the compress, slit into three tails, is then immediately passed, by means of a forceps, through the inter-osseous space from the palmar to the dorsal surface. The soft parts being thus protected and drawn back, the surgeon proceeds to the section of the bones, commencing with the radius; he continues the section in such manner as to act at the same time upon the radius and ulna, but so as to finish upon this last bone.

*d. Fourth Stage.*—After the amputation of the limb, and the retractor compress is removed, the assistant charged with drawing back the soft parts, immediately relaxes them. We then attend to the arteries, searching for them successively in the depth of the tissues. The anterior inter-osseal which is accompanied by a nervous filament, which it is well to avoid, is usually found upon the middle of the palmar surface of the ligament of the same name. The radial situated more externally and superficially, is seen between the supinator radii longus, the flexor carpi radialis and the flexor longus pollicis manus; it is besides so remote from the nerve that its ligature does not in this respect exact any special precaution. In order to find the ulnar artery with its accompanying nerve on its inside, we must look for it on the inner side of the arm and between the flexor carpi ulnaris, the flexor digitorum sublimis, and the flexor digitorum profundis. As to the posterior inter-osseal artery, which is distributed through the fleshy mass of the extensor muscles, there is no need of troubling ourselves about it, unless amputation is to be performed at the upper half of the fore-arm.

*e. Fifth Stage.*—The lips of the wound are to be brought together from before backwards, and it is in this direction that the adhesive strips are to be applied. We thus obtain a transverse linear wound, whose angles embrace the bones, and have hanging out from them the ends of the corresponding ligatures on either side, while the end of the middle ligature is to be brought up directly in front.

II. *Process of Alanson.*—If the skin should be lardaceous, (lardacée) or have contracted morbid adhesions with the subjacent tissues, it would be better, after having made the circular incision through it, to dissect it up and turn it back upon its outer surface so as to form a ruff in the manner of Alanson and Brunninghausen.

III. *Anonymous Process.*—Should any difficulty be apprehended about dividing the muscles and tendons which are found at the bottom of the

inter-osseous fossæ, we may, after the integuments are incised and raised up, glide the knife flatwise between the bones and the soft parts, and immediately after turn up its cutting edge outwardly, so as to cut transversely from within outwards all the soft parts on a line with the raised-up skin, and do this in succession upon both sides of the limb. It was M. Hervez de Chégoin, (*Mém. de l'Acad. Roy. de Chir.*, t. II. p. 273,) I believe, who in the year 1819 first published the suggestion of this modification, which M. Cloquet says he has often employed with success, (*Dict. de Méd.*, t. II., p. 153,) and which, from inadvertence no doubt, the editors of Sabatier had appropriated to themselves.

IV. All the muscles being divided, it is possible that we may desire to detach them still more, in order to be enabled to saw the bones higher up. In this case we detach with the point of the knife or bistoury the two borders of the inter-osseous membrane to the extent of some lines. Here, as in all other points of the limb, we ought to preserve so much the greater extent of integuments, as the operation is performed higher up, or to speak more correctly, in proportion as the volume of the part is more considerable. Nor must we forget that owing to the deep-seated muscles being inserted upon the bones nearly throughout their whole extent, they retract but very little towards the elbow, and that it is therefore principally on the skin that we must rely for uniting the wound and covering the stump.

B. *The Flap Method*.—Circular amputation of the fore-arm generally succeeds very well, and allows the cure to be accomplished in the space of from three to four weeks. Nevertheless it has been proposed to substitute the flap method for it. In our own times it has still been employed by M. Graefe, in the manner recommended by Verduin, and Lowdham, and as Ruysch says he has seen it performed, that is, by cutting a flap on the palmar surface of the limb and finishing the rest of the operation in the same manner as in the circular method. Vermale, Ledran, (*Opérat.*, p. 565, 569,) Klein, Hennen and M. Guthrie, prefer, on the contrary, making two flaps, one in front, the other behind. Under this point of view it would be difficult to withhold the preference from the process of Vermale, which is eulogized also by M. Langenbeck (*Rust's Handb. der Chir.*, t. I., p. 693,) and Rossi, (*Opér. cit.*, t. II., p. 233.) over that of Verduin. I have performed it and also caused it to be repeated upon the dead body by a great number of pupils. I have performed it on the living subject twice, and I am satisfied that it is generally less advantageous than the circular method, though the operation is easier and more quickly done. It is true that it is not then with the skin only but also with much of the fleshy fibres that we cover the extremities of the bones. The two flaps are sufficiently thick, and supplied with a sufficient abundance of cellular tissue to adapt themselves accurately together, and to furnish with security all that could be required for immediate union. To be enabled then to unite by first intention, each should have a length of about two inches. If the disease extends more on one side than on another, we need not make but one flap, or we may give them an unequal length. So that one does not perceive at first why this mode of operating may not be applied as low down as the circular method. Unfortunately upon examining it more attentively, it is perceived that most of these advantages are illusory. All the

muscles cut with a sloping edge necessarily augment the traumatic surface. Being included within the thickness of each flap, they serve only to increase the danger of the inflammations which may be developed. The bones also are not the less exposed to protrude at the angles of the wound; and the most simple reflection makes it apparent, that, by a circular incision, an inch of integuments will more accurately close up a wound of two inches width from before backwards, than flaps one-half longer, because of the void which these latter constantly tend to leave at each side of their base. The following, however, is the operative process:—

I. *Operative Process.*—The limb being turned in pronation, and properly held, the operator cuts his palmar flap, by passing his knife from one side of the fore-arm to the other, between the bones and the soft parts, which latter he divides obliquely from above downwards. To form the dorsal flap, he draws the lips of the wound backwards, replaces the point of the instrument in the upper part of the first division, causes it to glide posteriorly, and finishes with the same precautions as before. Directing the assistant to turn back immediately all the soft parts, he passes round the radius and ulna as in the circular method, cuts what may remain of the soft parts, inserts the retractor and afterwards effects the section of the bones as in the usual mode.

II. *Remarks.*—By cutting the palmar flap first, we are enabled to give greater thickness to the dorsal, and the palmar surface of the fore-arm being turned downward, the blood which escapes at first, in no wise interferes with the remainder of the operation. Moreover this precaution is far from being indispensable. The important point is to obtain two flaps of nearly equal dimensions, and not to take off too much of their angles. It is certainly remarkable that a military surgeon who, no doubt, in the movement of armies is prevented from keeping pace with the progress of science, has conceived the idea of applying the ovalar method to amputation of the fore-arm, and of making the point of the oval fall upon the ulna! The limb might be left in supination instead of placing it from the beginning in pronation; but then the sawing of the bones would produce more concussion upon the joints and would not be as easy.

The radius and ulna are recommended to be sawed at the same time, so as to finish however on the last, because the ulna, from being more firmly connected with the humerus, supports the action of the instrument better than the radius could do. In directing the operator to place himself on the inside between the limb and the trunk, I have not pretended to lay down an invariable rule. Bertrandi (*Opér. cit.*, p. 473) remarks, that when the patient is in bed, if we did not place ourselves upon the outside, we should be little at our ease, at least for the right limb. The English and German surgeons, and among them M. Guthrie, are in an error in saying that the flap operation is only applicable to the upper part of the fore-arm. It is applicable to its entire extent. Ledran (*Opér. cit.*, p. 563.) had already remarked that a patient operated upon by him in this manner, recovered in twenty days, while by the circular method he did not obtain cicatrization under two or three months; which, however, is in no respect remarkable, because at that time they were not yet successful after circular amputation in obtaining union by the first intention.



III. Reunion and the *dressing* are performed here in the same way as at the wrist, and the consequences of the operation exact the same precautions in both cases. M. Davidson performed this amputation successfully for an elephantiasis of the hand; but M. Mussey, (*Gaz. Méd. de Paris*, 1838, p. 394,) was obliged to amputate also the arm and afterwards the shoulder; M. Baud (*Thèse* No. 142, Paris, 1831) has performed it, though there was a fracture of the arm; in a patient of M. Blanche (Puchot, *Thèse* No. 207, Paris, 1835) no ligature was required; and Hoeff (*Gazette Salut.*, 1787, No. 7) also performed it without tying the arteries.

### § II.—*Amputation in the Contiguity.*

Some surgeons of the last century, on the strength of a passage in Paré, (liv. XII., ch. 37,) who says he ventured to disarticulate the fore-arm that had become gangrenous in a soldier with a fracture, have supposed that by systematizing this operation, practice might derive some advantages from it, that among others of saving three or four more inches to the limb than in cases where amputation was performed on the arm itself; other facts confirm this remark. In a nun, says Cattier, (*Biblioth. de Planque*, t. V., p. 11, in 4to.,) who would not permit herself to be amputated upon the living part, the fore-arm ultimately detached itself at the elbow, and the patient recovered. A girl, (*Acad. des Sc. Hist.*, p. 41, art. 10, 1703,) in whom the two fore-arms had separated at the elbow, took them herself to the Academy of Sciences! But many of the moderns have objected that this advantage is of too trivial importance to be purchased at the risk of numerous difficulties and dangers of every kind which must necessarily accompany a disarticulation of this nature. If it be possible to cut from the soft parts a flap sufficiently long to cover the whole extremity of the articulating surface of the humerus, it must be equally practicable to do so in circular amputation immediately below the joint. In the contrary case it is remarked, that we ought not to decide upon leaving so large a cartilaginous surface exposed, and that amputation of the humerus would therefore become indispensable.

These arguments are less conclusive than they at first sight appear. Because the soft parts may be in a condition to be saved, it does not follow that the bones are sufficiently sound to allow of the action of the saw, or to preserve the least portion of them. Necrosis, caries, comminuted fractures, &c., may extend up to the articulation, and without the surrounding parts having entirely lost their primitive character. The diseased bones also being once removed, who does not know that the soft parts ultimately often become restored to their natural state? Moreover, the operation in itself less dangerous than amputation of the arm, is far from being as difficult as has been imagined. M. Rodgers, (Velpeau's *Anat.*, American translation, etc., annot., Vol. II., p. 520,) of New-York, and M. Chiari, (*Bulletin de Férussac*, t. XII., p. 275,) have performed it successfully, and Dupuytren has also had every reason to be satisfied with it. For myself, I consider it advisable, wherever the bones are diseased to the extent of an inch or two from the joint.

[Dr. James Mann, of Connecticut, performed this operation in 1821. The patient had received a gunshot wound, which carried away nearly the whole of his right fore-arm. For seven days there was a profuse discharge of synovial fluid, but this at length subsided, and in four weeks, a cure was effected (*N. Y. Med. Repository*. Vol. VII. 1821.) Dr. J. Kearny Rodgers operated at the New-York Hospital in 1827. The discharge from a musket had badly shattered the radius and ulna, and as there was not enough of the integument, to cover the ends of the bones, he amputated at the elbow joint. In two days the stump had completely united, except in the course of the ligatures. In about three weeks, these came away, and the stump was perfectly sound. (*Op. Cit.* Vol. VII. or *N. Y. Journ. of Med. and Collat. Sciences*, Jan. 1853.) In the *Gaz. des Hop.* 1839, is a notice of a successful case by Blandin. M. Roux is opposed to this operation, but Mr. Liston in his *Lectures on Surgery*, Lond. *Lancet*, 1845, remarks that he has performed it more than once, and that "there is no objection to it." G. C. B.]

B. *The Flap Method*.—Owing to circumstances, or from necessity, Paré either has not, or but very obscurely, described, his method, supposing, without doubt, that any person could divine or imitate him.

I. *Process of Brasdor*.—After various trials, Brasdor (*Mém. de l'Acad. de Chir.*, t. V.) determined upon the following rules: A semi-lunar incision, with its convexity downwards, and comprising the posterior half of the circumference of the limb, is first made at some lines below the apex of the olecranon, in order to enable us to divide the lateral ligaments, and the tendon of the triceps, and to lay open largely the articulation of the radius. The knife then passed flatwise from one side to the other, between the anterior surface of the bones and the soft parts, forms a large flap whose base corresponds to the joint, and its apex to a point three or four inches below. Finally, we terminate by disarticulating the ulna from the coronoid process to the olecranon, and by the division of the triceps muscle, if that has not already been done in the beginning.

II. *Process of Vacquier*.—In the third Thesis in quarto, supported at the Faculty of Paris at the commencement of the present century, Vacquier proposes the following modification to the process of Brasdor: he commences by cutting with a double-edged knife the anterior flap from below upwards, as high up as to a line with the articulation; then divides the ligaments which unite the radius and ulna to the humerus; luxates the fore-arm, and terminates by detaching the olecranon from the large tendon which is inserted upon it, and from the integuments, so as to leave a flap of some lines in length behind.

III. *Process of Sabatier*.—Sabatier ascribes to Dupuytren the process by which it is considered more advisable to saw through the olecranon and leave it, rather than to remove it, and to form a flap of the character of that of La Faye for amputation of the shoulder, or of that of Verduin in amputation of the leg, rather than literally imitate the process of Vacquier.

IV. *Process of Dupuytren*.—According to MM. Sanson and Bégin, Dupuytren performed amputation at the elbow-joint seven or eight times successfully, by cutting a flap after the manner of Verduin, that is to say, by plunging a double-edged knife in front of the articulation, from

one tuberosity of the humerus to the other, between the bones which he grazes and the soft parts which are raised up with the left hand, in order to divide them from above downwards. The disarticulation being effected, Dupuytren completes the operation by sawing through the olecranon, or removing it.

The difference between these various processes is much less than Vacquier supposes. The final result of all of them is nearly the same, except that that of the member of the ancient academy, being a little more tedious and difficult, ought to be laid aside.

V. *Process of the Author.*—I see no advantage in preserving the olecranon, as Sabatier advises, and as Dupuytren has frequently done. The triceps does not require it for the movement of the humerus, and it is evident that its preservation can in no way favor the success of the operation. For the saw to reach its anterior surface, it is necessary that the articular surfaces should be completely disjointed. No obstacle can then interpose to prevent our detaching it from the integuments which cover it behind. But supposing that there positively exists a wish to preserve it, the following modification has appeared to me to present some advantages. The limb is held moderately flexed, and in supination. With a knife with one cutting edge only, we make an incision transversely on the upper part of the fore-arm, a little below the tuberosities of the humerus, in order to form a flap after the manner of Dupuytren. The assistant takes hold of this flap and raises it up. The operator then divides transversely, as in the circular method, an inch below the condyles, the teguments which remain behind; causes the skin to be raised up, returns in front, divides the external lateral ligament, and disarticulates the radius. Finally, after having carefully divided all the soft parts which surround it, he saws through the ulna, immediately below the anterior border of the coronoid process, as near as possible to the joint, and in a direction continuous with the humero-radial interline, [*i. e.*, the line of the inter-articulating surfaces of the humerus and bones of the fore-arm. T.] We thus avoid all the difficulties attending the disarticulation of the humerus, and the operation is as speedy as by any other mode; there is no need of making any traction or exertion upon the bones, and the wound, which has considerably less width, must be less disposed to suppurate, and more easy to unite by first intention.

VI. *Another modification*, applicable to all the flap processes, and which I should much prefer, would consist in cutting and dissecting the parts from the skin to the bones, instead of plunging the knife at first between the flesh and bones, as is the objectionable practice in *amphitheatres*.

B. *Circular Method.*—I have satisfied myself that circular amputation, in these cases, would offer decided advantages. An inch of integuments, preserved below the elbow, would be sufficient to cover the trochlea of the humerus, while, by the flap method, there would be required three or four in front. All the muscles being sacrificed, the wound would in reality be less in extent, less disposed to an abundant suppuration, and cause less intense reaction upon the system. After having divided the skin circularly, I dissect it, and turn it back as high up as on a level with the joint, after which I divide the anterior mus-



cles, then the lateral ligaments in order to disarticulate from before backwards, and terminate with the division of the triceps behind. The brachial artery alone requires tying or twisting, and the reflected fold of skin may be brought down without the least difficulty in front, so as to close up the wound.

## ARTICLE V.—AMPUTATION OF THE ARM.

Amputation of the arm, required most generally for some disease of the humero-cubital articulation, is usually performed below the middle part of the limb. As other affections, however, such as lesions of the humerus itself, may also exact this operation, we are sometimes compelled to amputate much nearer the shoulder.

### § I.—*Anatomy.*

The humerus, constituting the only bone in the arm, cylindrical in its middle portion, twisted slightly upon itself, and near the elbow flattened in such manner that its borders are felt naked under the skin, is also surrounded with numerous muscles. The deltoid, coraco-brachialis, long head of the triceps and the biceps, which are all attached to the scapula, together with the pectoralis major, and the latissimus dorsi, [see Table of Muscles, Vol. I.,] form a distinct system, whose retractile powers we must make allowance for when we are about to amputate above the deltoidal tuberosity. As these muscles are all inserted below the head of the humerus, M. Larrey came to the conclusion that, in amputating upon a line with the surgical neck, the fragment of bone preserved would be of no use, but, in fact, hurtful, from being kept in a state of permanent extension by the supra-spinatus and infra-spinatus muscles. Below the deltoid-muscle, the biceps which extends from the shoulder to the fore-arm without any adhesions, is the only one after its division which can retract to any considerable degree; the others, the brachialis internus, and the three divisions of the triceps, having their fibres implanted upon the humerus itself, cannot retract but very little from the point where the knife has divided them.

### § II.—*Operative Process.*

If, like Petit, after having divided and raised up the skin, we should confine ourselves to dividing all the muscles upon the lower half of the arm at the point upon which the saw is to be directed, the biceps would rarely fail by its subsequent retraction to produce a denudation of the bone.

A. *Circular Method.*—The integuments are too moveable upon the aponeurosis to require the trouble of dissecting them and turning them back upon their external surface, as Alanson proposes. Among the processes then to be selected, there remains that of Celsus or Louis, modified by Dupuytren, and that of Desault.

I. *The Lower Half.*—The patient being seated, and the artery compressed, as in amputating the fore-arm, an assistant seizes the limb and raises it from the trunk at almost a right angle. The rule recommends

that the surgeon should place himself upon the outside ; but when we operate on the left arm there is some advantage in placing ourselves on the inside. With the left hand we draw back the skin in proportion as the instrument proceeds. The division of the integuments is made as near the elbow as possible. In incising the muscles circularly on a line with the retracted skin it is important to cut through the whole thickness of the biceps. We may, in fact, after the manner of M. S. Cooper, divide, at first, this muscle only, in order to make the division of those of the deep-seated layer only, at a few lines from the point where we are to saw the bone. When the humerus is laid bare, it could not be otherwise than advantageous to separate the fleshy fibres from it parallel to its length, as was recommended by Bell, and as is still practised by M. Graefe. M. Hello (*Thèse* No. 258, Paris, 1829) also maintains that the deep-seated fibres thus preserved are the only ones which can be brought down in front. I will add to this, that it is then necessary to dissect the skin, as recommended by Alanson ; and afterwards to divide all the tissues perpendicularly and with a single stroke of the knife. In whatever manner we operate, we must take care that we do not wound the radial nerve. The last muscular layer should be divided at about three inches above the line of the division of the integuments. The retractor compress, and the section of the bone require no particular directions.

The brachial artery is found between the biceps and the inner portion of the triceps, close to the median nerve, and between its two accompanying veins. The situation of the other two or three branches which require some attention, will be indicated by their bleeding. The practice of closing the wound from one side to the other, though there would, in fact, be a little less void to be overcome in closing from before backwards, arises from the preference that exists of having a cicatrix directed from before backwards, rather than transversely.

II. The *Upper Third*.—The biceps above the *deltoid depression*, being at this point nearer to its origin, cannot retract as far ; but the volume of muscular tissues being much greater, it is as indispensable as it is lower down to save a considerable portion of integuments, and to favor their retraction as much as possible before making the section of the bone. De la Faye (*Mém. de l'Acad. Royale de Chir.*, t. II., p. 241) had already proposed, and Leblanc (*Précis d'Opér.*, t. I., p. 328) combated the process advocated by M. Larrey, (*Clin. Chir.*, t. III., p. 560,) to wit : that it is better to disarticulate the humerus than to amputate it above the muscles, which connect it with the chest. The advice of Leblanc, Percy, (*Rapport à l'Institut sur la Desarticulation du Bras*,) and Richerand, however, has prevailed. Experience has proved that after the cure, the deltoid muscle, the pectoralis major, the latissimus dorsi, the teres major, and coraco-brachialis, are not without their action upon *this small extremity of bone* as De la Faye called it, and that they may execute various movements upon the stump. The small portion of the arm which remains, augments at least the protuberance of the shoulder, prevents the slipping of the suspenders, preserves the hollow of the axilla, and most usually allows of holding against the chest certain foreign bodies, as for example, a cane, and port-folio. "It is a constant source of satisfaction to me," says M. Champion, "when

I reflect upon the usefulness which a stump like this has proved itself susceptible of, in three patients in whom I had saved it." Besides, it is not necessary then to open into the articulation, nor consequently to fill up the large *cul-de-sac* which exists between the acromion and the scapular tendon of the triceps muscle.

**B. Flap Method.**—The arm is the limb which appears to be the least favorable to the flap method; so much the more so as its rounded form and the position and small volume of its bone are wonderfully adapted to the success of the circular method. Klein and M. Langenbeck, notwithstanding, have endeavored to bring the other into vogue. I have myself had recourse to it on two occasions on living man, and have often performed it, or caused it to be performed, upon the dead body. At the first glance, we might suppose that a great advantage could be obtained from it, for union by the first intention. By the flap method, it is not the skin only, as in the circular, but the muscles themselves, which cover the extremity of the bone and shut up the wound; in this we have nothing to fear from the retraction of the muscular fibres or the isolation of the cutaneous envelope; three incisions by the knife, one for each flap, and another for the denudation of the bone, and one division by the saw, complete the whole operation. Well! with all these advantages, the rapidity and facility of the manipulations are all that are real. The muscular mass to which so much value is attached, is, after all, calculated only to favor phlegmonous inflammation of the stump, with a constant tendency to slip from one side to the other, and, should suppuration ensue to ever so slight an extent, to protrude the bone through one of the angles of the wound. Nowhere, in fact, are the inconveniences of the flap method so conspicuous. Nevertheless, Sabatier himself advises it when we are obliged to amputate near the shoulder.

**I. Process of Klein.**—A narrow knife, plunged through the arm, from the radial to the ulnar side, and grazing the bone, cuts out a first semilunar flap of about two inches in length; after having formed another in the same manner upon the opposite side, both are raised up; we then divide at their base the small quantity of muscle still adherent to the bone, which last is sawed with the usual precautions. It is almost a matter of indifference also whether we begin with one flap or the other.

**II. Process of M. Langenbeck.**—The assistant raises up the integuments with force; the operator, seated on the inside, supports the lower part of the limb with his left hand for the right arm, and *vice versa* for the left arm; provided with a good knife in the other hand, he cuts with a movement from below upwards, and from the skin to the bone, an inner flap, which should have, as in the preceding case, a length of from two to three inches; then, in passing the knife and his wrist underneath, to bring them back in front of the arm, he is enabled thereby to form an outer flap similar to the first. I have seen young German physicians practise this process in our theatres, and execute it with the greatest celerity; but such exhibitions of power and address can possess no importance except in the eyes of those surgeons, who, like the pupils of MM. Langenbeck and Graefe, go for those only who, in amputations, operate with the greatest rapidity, and count even the seconds.

**III. Process of Sabatier.**—Sabatier recommends the flap method only in cases where the operation is performed so high up that it is impossi-



ble to employ the tourniquet. His process which had already been described by Leblanc, (*Opér. cit.*, t. I., p. 327,) consists in forming, by means of a transverse incision and two longitudinal incisions, a flap, of the shape of a trapezium, at the expense of the antero-external portion of the deltoid muscle, then in raising this flap up, and by a circular incision, dividing the remainder of the soft parts before proceeding to the section of the bone. It is to be understood, moreover, in this case, as in all others, when the amputation is to be performed near the shoulder, that the compression of the artery should be made above the clavicle, or upon the second rib, as I shall point out farther on.

[*Artificial Arm.*—In cases where a fragment of the humerus is preserved, M. Van Peterssen, a Dutch sculptor, according to the report of M. Majendie, made to the Academy of Sciences of Paris, Feb. 17, 1845, (*Gaz. Méd.*, Feb. 22, 1845, p. 125–126,) has contrived an ingenious piece of mechanism, which, both in its form and articulations, representing the wrist, hand, and fingers, is made to execute by means of springs and the leathers, by which it is fixed to the stump and chest, a great number of the functions of a living, healthy arm, so as to become exceedingly useful in seizing bodies with the hand, lifting a tumbler, food, &c., to the mouth, in fact, performing a great number of the movements of flexion, extension, &c. The whole weight is but 500 grammes, and the cost about 500 francs or less. The examination made by the commission of the Academy (of which M. Velpeau was one) of persons who had had this apparatus substituted for one or both arms, proved highly satisfactory, and their report expresses unqualified commendation of the invention, in which favorable conclusions the Academy also entirely concurred. T.]

#### ARTICLE VI.—AMPUTATION OF THE ARM AT THE SHOULDER JOINT.

It is an error to suppose that disarticulation of the arm had not been ventured upon until the beginning of the last century. Laroque, (*Journ. de Méd.*, 1686, Juin, p. 3,) in the year 1686, relates a case of this operation. The limb had become gangrenous. “The surgeon took a small saw to amputate the humerus; but having perceived that the bone shook near its articulation *with the shoulder*, he made a jerk upon it, when the bone readily escaped from its socket, (boit,) after which the boy was soon restored to his former health.” Though the idea must have often presented itself to the minds of surgeons, as to La Gareine, (*Bibliot. de Planque*, t. V., p. 9, in quarto,) the fear of opening into so large a joint, and the ignorance of the means how to suspend the course of the blood in the limb during the operation, together with the proximity of the trunk, had deterred the boldest practitioners from undertaking it. Le Dran (*Garengeot*, 2e édit., tome III., p. 454; 1e édit., tome II., p. 382, 1720) is the first who has described it. His father had had recourse to it about the year 1715, (*Obs. de Chir.*, t. I., p. 315,) for a necrosis of the humerus, accompanied with copious suppuration, and completely cured his patient. Since then, it has been pretended that Morand, the father, (*Opuscles de Chir.*, p. 212, 2e partie,) or Duverney, (Mihleew, *Elements of Surgery*, &c., 1746,) had performed it before Le Dran, but

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of this no satisfactory proof has been given. At the present time, the advantages of this amputation are no longer disputed by any one. It has been so often performed that it is useless to discuss its practicability.

[Mr. Guthrie informs us in his *Lectures on some of the more Important Points in Surgery* p. 6, that previous to the return of the medical officers of the army, in 1814, teachers of surgery in London, taught that amputation at the shoulder joint was a most formidable operation on account of the impossibility of arresting the flow of blood. This fear however, did not deter American surgeons from performing it in 1781, 1782, as was done by Dr. John Warren of Boston, and Dr. Bailey of New-York. Previous to 1814, also, Dr. Bowen of Providence, had at the same time with the arm removed the acromial end of the scapula. For the details, we refer the reader to the *Bost. Med. & Surg. Journal*, Vol. XX., 1839, p. 210; and *New England Journ. of Med. & Surg.* Vol. III. 1814, p. 314. G. C. B.]

### § I.—Anatomy.

The articulation of the shoulder being surmounted by two processes which extend beyond its line in front, and greatly augment its vertical diameter, presents an arrangement much more favorable for immediate reunion in a transverse direction, than from above downwards. In its union with the body of the bone the head of the humerus forms an extremely open angle, and the fibrous capsule is inserted a little upon the inside. In the amputation it is necessary that the edge of the instrument should describe a circular line exactly corresponding (semblable) to the plane of the hand, if we desire to separate the fibrous tissues from it with facility. Finally, the glenoid cavity, surrounded with a tendinous border, having greater height than width, seems to be still further prolonged upon its upper part by means of the vault formed by the two processes just mentioned.

In proceeding from above downwards, we find about this joint, besides the common integuments and a very thin aponeurotic layer, the deltoid muscle, a loose cellular tissue, the tendons of the supra-spinatus, infra-spinatus, sub-scapularis and teres minor muscles, together with the fibrous capsule and the tendon of the long division of the biceps; on the inside the coraco-brachialis and the other portion of the biceps; lower down the scapular portion of the triceps; then the brachial plexus and axillary vessels, and under the skin the pectoralis major, the latissimus dorsi, and the teres major muscles. Many of these parts may be readily recognized upon the outer surface. Thus the apex of the acromion is easily distinguished above the stump of the shoulder, and on the inside appears to be continuous with the clavicle. The coracoid process a little nearer to the thorax, and more prominent than the last mentioned bone, may also be very easily distinguished by the touch. In that part is found also a triangular space which may be made of practical value. Bounded on the outside and below by the head of the humerus, above by the clavicle and acromion, and on the thoracic side by the coracoid process, this space conducts directly into the articulation. The posterior border of the axilla, raised up and turned outwardly upon the side of the scapula, also enables us to reach below the

acromion and to traverse the upper and outer part of the articulation. In some persons the acromion is much more prominent than in others. Sometimes also its anterior border is greatly depressed, so that its humeral side presents a very deep cavity. In infancy it remains a long time cartilaginous. In two subjects, considerably advanced, that is to say, adults, I was enabled by a very slight effort, to separate it as an epiphysis of the spine of the scapula. These different anomalies being of a nature to render disarticulation of the arm either more easy or more embarrassing, should, as well as the other anatomical details which I have just given, be always present in the mind of the operator.

## § II.—Operative Process.

The amputation of the arm at the joint, is one of those that offer the greatest variety in the number of the operative processes. Every surgeon, who has performed it, has deemed it his duty to propose one. The circular flap and ovalar methods, and all the different modifications that these general processes admit of, have been used for this amputation.

A. *The Circular Method.*—The idea of applying the circular method to the disarticulation of the arm, does not belong, as M. P. F. Blandin (*Dict. de Méd. et de Chir. Prat.*, t. II., p. 258) supposes, to the author of the article on *Amputation* in the Encyclopedia. De la Roche, (*Encyclop. Méthod. Chirurg.*, t. I., p. 109,) who prepared this article, adopts the flap, and not the circular method; but Garengéot (*Opér. cit.*, p. 460, t. III., 2e edit.; t. II., p. 378, 1e edit.) says positively that, in his time, several persons gave it the preference. Bertrandi (*Opér. de Chir.*, p. 454) also speaks of and censures it. Alanson described it in 1774, and proposes that the muscles should be divided obliquely, as in amputation of the thigh. It is a great error, therefore, for M. Graefe to have supposed that he was the inventor of it, and that other moderns should have claimed this honor; but each one of these authors has presented it under a particular point of view.

I. *Ancient Process, or that of Garengéot.* The passage in Garengéot which refers to the simple circular method, points out, but does not describe, this method. The artery being compressed by an indirect ligature, [see vol. I.,] and the soft parts raised up by an assistant, an incision is made successively through the integuments and muscles down to the bone, commencing at three fingers' breadth below the acromion; a last cut of the knife detaches the head of the humerus from the glenoid cavity, and completes the operation.

II. *Bertrandi* is evidently more clear. A large convex bistoury divides through the body of the deltoid upon its dorsal surface, at some distance from the acromion, arrives at the biceps muscle, opens the capsule, passes behind the head of the humerus after we have luxated it, and terminates the division of the soft parts with that of the posterior half of the limb; "so that when the arm is separated, there remains a circular incision through the soft parts, around and in front of the glenoid cavity."

III. *M. Cornuau* (*Thèse No. 71, Paris, 1830*) has proposed a process founded on the same principle as the preceding. The skin being divided at four fingers' breadth from the acromion, and drawn back by



an assistant, the operator proceeds to the section of the muscles, which he accomplishes with a single stroke of the knife, carried transversely from the coraco-brachialis muscle down to the tendon of the teres major, causes them to be raised up, opens into the joint, which he traverses from above downwards, grazes the neck of the humerus, and terminates by a second transverse incision, which unites the two extremities of the first, includes the vessels, and make a circular wound.

IV. *Process of Alanson and M. Graefe*.—Alanson's method has nothing in it peculiar. But M. Graefe, in order to form, at the expense of the muscles, a hollow cone with its base downwards, uses the broad point of a buckler-shaped knife.

V. *Process of M. Sanson*.—Adopting the pure circular method, M. Sanson (*Elem. de Pathol.*, etc., t. III., p. 498, 2e edit.) divides at the same stroke both the skin and muscles, at an inch below the acromion and before disarticulating the humerus.

VI. *Process of the Author*.—I have repeated all the modifications of the circular method upon the dead body, and have ascertained that there is no other method more rapid, or forms a more regular wound, or one more easy to unite by the first intention. The process which has seemed to me to combine the most advantages, consists in dissecting and raising up the skin to the extent of two fingers' breadth, and without interfering with the vessels; then to divide the muscles as near as possible to the joint, which is to be immediately laid open; terminating the operation with the division of the triceps, and of the bundle of vessels whose trunk has been previously secured by an assistant.

B. *The Flap Method*.—The different processes included under the flap method, may be divided into two classes. By one, we make a transverse wound; while the others, on the contrary, produce a solution of continuity whose greatest diameter is the vertical.

I. *Transverse Method*.—Each one of these two classes forms, to some extent, a particular method, whose respective advantages and disadvantages should be carefully considered. The first was for a long time the only one employed, and to this belong the processes of Le Dran, Garengot, De la Eaye, and Dupuytren.

a. *Process of Le Dran*, (*Opérat.*, p. 571.)—The patient being seated upon a chair, an assistant seizes the arm and holds it at a short distance from the trunk; with a narrow knife, the surgeon then makes a transverse incision through the deltoid, the two portions of the biceps a little in front of the acromion, the tendons which are attached to the head of the humerus, and the fibrous capsule: while an assistant gives a swinging movement to the arm, and luxates its head from below upwards, the surgeon, holding his knife constantly in a transverse direction, passes the instrument behind and cuts out a flap, of from three to four inches in length, at the expense of the muscles of the posterior part of the limb, in which flap are comprised the plexus of nerves, the vessels, the borders of the axilla, and various muscles.

b. *Process of Garengot*.—Garengot's mode of operating (t. III., p. 457) differs in three particulars from that of Le Dran. In order to compress the artery, he advises, instead of a straight needle, to use one that is curved, which is to be inserted from before backwards through the muscles, and to graze the neck of the humerus. With the view of

forming an upper flap at the expense of the deltoid, he recommends the first incision to be made at three fingers' breadth in front of the acromion. Finally, in terminating like Le Dran, with a flap in the axilla, he gives it less length and cuts it in a square shape, in order to adapt it better to the deltoid flap.

*c. Process of De la Faye.*—La Faye (*Mém. de l'Acad. de Chir.*, t. II.) does not apply any previous ligature. Differing from Garengcot, and coinciding with Le Dran, he recommends but one flap only; but, instead of placing it below, he takes it from above, and gives it the form of a trapezium. A transverse incision is first made, at about four fingers' breadth from the apex of the acromion; two other incisions, one of which is begun upon the inside and the other upon the outside of this process, are continued in a line with the muscular fibres to the extremities of the first. The flap being dissected and raised up, enables us to enter the joint, luxate the humerus, lay bare the soft parts of the axilla, and to apply a ligature upon the artery before detaching the arm from the trunk immediately underneath. In place of a trapezium flap, Portal, (*Précis de Chir.*, t. II., p. 791,) imitating Dahl, (*Amputat. ex Articul.*, etc., 1760,) prefers one which is V-shaped.

*d. Process of Dupuytren.*—In a thesis supported in 1803, Grosbois recommends the following modification of the process of La Faye: With one hand he seizes the whole thickness of the soft parts which are to form the upper flap; with the other he plunges through these tissues at the base of the deltoid, with a small knife held horizontally, and the cutting edge of which is to be directed forwards; the flap is then cut out from behind forwards and from within outwards, taking care to give it the suitable length. Grosbois speaks of this modification as one that belongs to him, and which he had long reflected upon. It is probable, however, that he derived the idea of it from the lectures of Dupuytren, for it is under the name of this professor that it is generally known.

*e. Process of M. V. Onsenort*, (Graefe and Walther, *Journal*, t. X., p. 469.)—In place of forming the deltoidal flap by cutting from the soft parts to the skin, it may be done in the opposite direction; that is to say, from the integuments to the articulation and from the apex to the base, giving it also a semilunar form. This mode, too, which does not differ materially from that of Garengcot, is also, by some pupils of medicine, ascribed to Dupuytren. I have seen MM. Dubled and Guersent (the younger) perform it upon the dead body with great rapidity; and M. V. Onsenort, who uses a knife curved on its flat side, endeavored, in 1825, to point out its great advantages. Cline, who commences by compressing the artery upon the first rib, and who makes a flap capable of covering the wound with a narrow knife at the expense of the deltoid, then divides the articulation, and with a single stroke the muscles which connect the arm to the shoulder and the trunk. This process, which the surgeon of London was in the habit of employing a long time since, and which is adopted also by Chiari, (*Renzi, trad. Ital. de ce Livre*, p. 306,) is described by M. Smith, in the work by Dorsey, (*Elements of Surgery*, vol. II., p. 222,) in an exceedingly obscure manner; it has, however, a good deal of resemblance to the preceding, and I ought to add that, in making trial of it by the mode indicated, I found that I could perform the operation with almost inconceivable rapidity.

*f. Process of Grosbois, attributed to MM. Lisfranc and Champesme.*—Grosbois (*Thèse* No. 190, Paris, 1803) had already remarked that another advantage could be obtained from his proposed modification of the process of La Faye, by proceeding in such manner as to open at the same stroke into the upper part of the articular capsule. MM. Lisfranc and Champesme have constructed from this suggestion the basis of a new process, (Coster, *Manuel de Méd. Opér.*, 3e édit., p. 95.) The arm being slightly approximated to the trunk is carried upwards and outwards. The operator being placed in front of the shoulder applies the point of his knife to the coraco-acromial triangle, one of its edges being in a direction upwards and forwards, the other backwards and downwards; he then plunges it through the soft parts and the articulation from within outwards, from before backwards, and from above downwards, so that it may come out an inch behind the acromion; he then with one hand seizes the deltoid and raises it up; divides it from behind forwards and slightly from below upwards; passes round the upper part of the head of the humerus, giving gradually to the blade of the instrument a direction almost horizontal; separates the arm from the trunk as soon as he has proceeded in his incision to the extent of about an inch, and finishes the flap as in the process of Grosbois and Dupuytren.

*g. Bell* (*Cours de Chirurg.*, traduit par Bosquillon, t. VI.) commences with a circular incision at four inches below the joint; he then makes a longitudinal one upon each side in order to form two flaps in the manner of Ravaton; dissects and raises up these flaps, and finishes by disarticulating.

*h. The process of Laroche* (*Encyclop. Method.*, Part. Chir., t. I., p. 109) differs from the preceding in this, that the circular and lateral incisions being made, the author raises up the anterior flap, and proceeds to the division of the joint before completing the posterior flap.

*i. Appreciation.*—Of all these modes the most rapid and simple is that of Cline, or of M. Onsenort; but it is difficult then to give to the upper flap all the extent desirable. That of Grosbois which comes next, would be yet more rapid if in performing it, surgeons who are unpractised did not run the risk of striking the point of their knife against the head of the humerus or the acromion. It endangers, moreover, the formation of a flap much too thin at its base. It is evident, however, if we should be satisfied with an upper flap, that the process of Grosbois or of Dupuytren would be preferable to the three incisions of La Faye.

II. *The Vertical Method.*—To the second class of the flap method belong all those processes whose object is to place the flap in front or behind, or full as well to make one on each side.

*a. Process of Sharp.*—The first process which appears to belong to this series is that of Sharp, (*Opérat. de Chirurg.*, p. 389.) This author first divides the skin, the deltoid and the pectoralis major, from the apex of the acromion to the hollow of the axilla, so as to lay bare the vessels and to be enabled to tie them; he then passes through the articulation from within outwards, and terminates by dividing the soft parts on the opposite side, so as to preserve as much of the integuments as possible.



*b. The Process of Bromfield* is too complicated and too long to be described at present, though it belongs to the vertical method.

*c. Process of Poyet.*—Poyet (*De Méthod. Amput.*, etc., 31 Août, 1759) in a thesis upon the disarticulation of the arm, proposes to make a longitudinal incision from the apex of the acromion to nearly as far as the deltoid depression upon the humerus; then to separate the lips of the wound, in order to divide the articular capsule and the tendons which surround it, and to luxate the head of the bone, terminating by passing the knife between this last and the muscles which are divided with a single stroke from above downwards. Dorsey (*Op. cit.*, Vol. II., p. 333) of Philadelphia, was successful with a process nearly the same as that of Garengeot.

*d. The Process which Laroche describes* in the Encyclopedia, instead of belonging to the circular method, is no other than that of Bell or Ravaton, modified so that one of its flaps is upon the inside and the other upon the outside.

*e. Process of Desault.*—The limb held between extension and flexion is brought slightly forward; the surgeon embraces with one hand the tissues of the shoulder, and with a narrow knife divides them from above downwards and from before backwards, while grazing the head of the humerus; he forms a first and inner flap from three to four inches in length, which includes the anterior border of the axilla and the vessels and nerves, and which the assistant raises immediately up in order that the operator may divide the joint from before backwards or from within outwards, and terminate by forming a postero-external flap similar to the first.

*e. (bis) Hasselberg* (*Nouv. Procédé pour desarticuler l'Hum.*, 1788) in describing the process of Desault, says that the artery is compressed between the sealeni muscles, and the arm raised to a right angle, and that the knife ought at the very first to divide the articulation, and that this first flap has the form of a triangle. Allan (*Journal Général de Médecine*, t. VIII.) on the contrary represents that Desault formed his upper flap with the deltoid alone. Nevertheless it is certain that Giraud, (*Ibid.*, p. 414,) a pupil of Desault, recommends cutting a lower or axillary flap at first, then to divide the joint from below upwards, and to terminate with the upper flap.

*f. Process of M. Larrey.*—In operating after the manner of Desault, the artery is divided at the first stroke of the instrument, and this might lead to serious accidents if, from any cause whatever, it should afterwards become impracticable to terminate the operation promptly. M. Larrey has therefore considered that it would be better to commence with the posterior flap, open the joint on its external side, and terminate with the inner flap.

*g. Another Process of M. Larrey.* M. Larrey, (*Clin. Chir.*, t. III., p. 563,) who has so often performed this operation in the army campaigns, describes another process whose advantages he greatly extols. In the same way as is done by Poyet, he first divides the whole thickness of the stump of the shoulder in the direction of the fibres of the deltoid, and to the extent of four inches. He then separates the two lips of the wound, at the upper extremity of which he re-inserts the knife and plunges it from above downwards, so that it may come

out in front of the posterior border of the axilla, and thus form the outer flap. Returning to form in the same manner the anterior flap, and leaving between them all the soft parts which separate the two borders of axilla, in order to avoid the artery and plexus of nerves, he then divides the deep-seated tendons and the capsule. After having divided the joint, he passes the knife behind the head and surgical neck of the humerus in order to terminate with the section of the *pedicle* which unites the two flaps below, obtaining by this means a wound which is nearly oval.

*h. Process of Dupuytren.*—In the place of forming the posterior flap by puncture, Dupuytren cuts it from without inwards, that is, from the apex to the base, and in other respects proceeds in the same manner as M. Larrey.

*i. Process of M. Delpech.*—If we omit to form an outer flap, or give this flap but very little length, and strike almost directly upon the posterior face of the articulation in order to open into and divide it, terminating by cutting a large inner flap, we have the process of Delpech.

*j. M. Hello* (*Thèse* No. 258, Paris, 1829) after having cut an outer and upper flap like Dupuytren, proposes that we should afterwards pass the knife between the shoulder and the chest, to terminate the operation according to the rules of the circular method. This process adopted, he says, by Fouilloy, and which Laisne (*Jour. Gén. de Méd.*, t. VIII., p. 401) compelled by the state of the tissues, had also already employed, is particularly serviceable where the humerus is shattered, and where the displaced bony fragments render the formation of any flap whatever by puncture more difficult than usual. Two sailors thus operated upon in England about the beginning of the present century, were cured on the twentieth day.

*k. Process of M. Lisfranc.*—M. Lisfranc, in order to avoid the objections made to the process of Grosbois, and at the same time to retain its advantages, causes the arm to be held a short distance from the trunk, places himself outside of it, applying the point of a long knife in front of the posterior border of the axilla as if to raise up this border, divides the whole thickness of the muscles and the articulation itself from below upwards and from behind forwards, and brings the instrument out between the anterior border of the acromion and the coracoid process, raises the arm a little and inclines it slightly backwards, passes around the upper and posterior half of the head of the humerus with the blade of the instrument, cutting in this manner his posterior flap, and then returning to the joint and finishing like Dupuytren or Delpech.

*C. The Ovalar Method.*—Correctly interpreted, the origin of the ovalar method might readily be discovered in the processes of Poyet, Sharp, Bromfield (*Observ. & Cases, etc.*, 1773) or M. Larrey. It is nevertheless true, that it belongs neither to Béclard, to whom it is attributed in France, nor to M. Guthrie who was the first to describe it in England. I find it very accurately described in many theses of the school of Strasbourg, and especially in that of A. Blandin supported in 1803, and still more clearly in that of Chasley, who had already employed the term *ovalar* to designate the form of the wound. The several processes which it presents scarcely differ from each other.

I. *Process of M. Guthrie.*—In the process of M. Guthrie, the two incisions which should describe a kind of V, and which are made to set out from the apex of the acromion, to descend obliquely, the one in front, the other behind, down to the lower extremity of the corresponding border of the axilla, comprise at first no more than the common integuments. The muscles are afterwards divided in the same direction and a little higher up, that is to say, on a line with the retracted skin.

II. *Process of Béclard or Dupuytren.*—On the contrary, when we wish to imitate Béclard or Dupuytren, we go immediately down to the bone; but in both cases each side of the wound should be slightly convex in front and sufficiently superficial in its termination to avoid running any risk of wounding the vessels. The apex of the flap is detached and reversed downwards by a third stroke of the knife before proceeding to open into the articulation; in fact the base of the V remains untouched to the end of the operation, and is not detached until after having disarticulated the bone and grazed the posterior surface of its upper fourth.

III. *Process of M. Scoutetten.*—M. Scoutetten after having, like Sharp, brought the inner incision from above downwards, as far as the outward border of the axilla, while passing around on the axillary side of the arm, resumes it on the outside to prolong it from below upwards, with the precaution, carefully kept in mind, to divide only the skin under the root of the limb, and not to touch the vessels.

IV. *Process adopted by the Author.*—*a.—First Stage.*—When the muscular fibres are divided very near their origin, their retraction must be inconsiderable; it is therefore advantageous, when the patient has the shoulder abundantly supplied with muscular tissues, to follow M. Guthrie, and divide the skin and cause it to retract before proceeding farther. In an opposite state of things this precaution is unnecessary; the integuments and the muscles may then be divided with the same stroke of the knife.

*b. Second Stage.*—The delicate point in the oval method, is the opening into the capsule. If the bistoury goes too deeply the fibrous pouch recedes, becomes folded on itself like a piece of wet linen, and is rather masked than cut. If it should strike within the anatomical neck of the humerus, the ligamentous adhesions will be but imperfectly destroyed, and the difficulties will appear still greater. To obviate this embarrassment, we should, after the lips of the wound are separated by the assistant and drawn back towards the shoulder, seize the arm with one hand, make the head of the bone project, turn it upon its axis from without inwards, introduce flatwise a very finely sharpened bistoury between it and the tissues, place this bistoury afterwards at a right angle upon the capsule, on a line with or a little beyond the anatomical neck of the bone, and divide them upon its full edge, and *perpendicularly* all the tendons, commencing with the *teres minor* and finishing with the *sub-scapularis*, and while taking care to let nothing escape, use the head of the humerus as a point d'appui to make it roll upon its axis from within outwards, in proportion as the instrument proceeds from behind forwards, or from without inwards. By this means we open freely into the articulation, and can luxate the arm with ease; which enables us to make tension upon the parts of the capsule remaining, and



which we at length completely detach by directing the bistoury forwards, backwards and then inwards, as if for the purpose of grazing the bone.

c. In the *third stage* the assistant, placed outside the shoulder, glides his thumb upon the artery in front of the glenoid cavity, compresses this vessel in the species of pedicle which unites the lower extremity of the two first incisions, while with a small knife or the same bistoury he has been using from the beginning, the surgeon makes the section of the base of the primitive V, and completes the separation of the limb from the trunk.

V. When we wish the *two incisions* to set out from the acromion, we should make use alternately of the right and the left hand ; but should we not be ambidexter, it is very easy to make the second incision from below upwards, so as to unite it with the first. A good bistoury, rather convex than straight, answers for every stage of the operation. Some persons, however, prefer a small amputating knife ; and there are others who commence with the first and finish with the second of these instruments.

### § III.—Comparison of the different Methods.

In all the processes which have passed under consideration, to whatever method they may belong, the temporary suspension of the course of the blood must be attended to. The indirect ligature of Ledran and Garengéot is not to be trusted, and besides forms of itself an operation sufficiently grave. Ledran had already remarked (*Opér.*, p. 571) that it could be dispensed with. If, like La Faye, Paroisse, (*Opusc. de Chir.*, p. 208,) and some others, we apply a thread around the artery before completing the lower flap, we rarely fail to include in its parts that ought to have been avoided. We cannot imitate Sharp and Bromfield without increasing the sufferings of the patient and protracting the duration of the operation. Compression, on the first rib, as recommended by Camper, whether by the thumb or with a hand-pelote, or should we resort to the tourniquet of Dahl, applied upon the second rib in front of the clavicle, a kind of compression which Paul of Egina (Portal, *Anat. Méd.*, t. II., p. 232) had already pointed out to arrest the blood,\* they exact conditions which do not always exist, and would, if badly executed, expose the patient to the risk of perishing by hemorrhage under the hands of the operator. But we have it in our power, by doing as most of the moderns do, to prevent this accident by a plan far more secure and simple. For this purpose it is sufficient, as we have seen, to leave uncompleted the section of the flap which includes the vessels, until after having divided the articulation. The previous and direct ligature upon the subclavian artery which was still made use of in 1821 by M. A. H. Stevens, (S. Cooper, American Edition of his *Elements of Surgery*, 1822,) would not become necessary except in the event of extensive derangement of the parts.

In fact while the knife is passing from above downwards upon the posterior surface of the disarticulated humerus, the assistant placed behind, embraces the base of this flap in order to compress it between his thumb which rests upon the bundle of vessels, and the other fingers which act as a point d'appui upon the skin of the axilla. In place of

using one hand only, there would be no objection to our employing two, if the thickness and width of the soft parts preserved seem to render it requisite. By this mode of compression which is available for any one, it is evident that we may complete the operation without any apprehensions, and that the ligature upon the vessels afterwards requires no special directions. Without knowing who first gave this rule, Poyet, in his Thesis, supported in 1759, states that he followed it. Bertrandi (*Opérat. de Chir.*, p. 456) also distinctly mentions it, but without designating its author. Others attribute it to Ledran (*Ib.*, p. 571) himself, who in fact describes it in 1742, but in an imperfect manner. However this may be, it is hardly over twenty years, and since the recommendations of Deschamps, (Allan, *Jour. de Sédillot*, t. VIII.,) M. Larrey (*Clin. Chir.*, t. III,) and M. Rieherand, that it has become generally adopted. The other arteries which it is also sometimes advisable to tie, are the axillary, the external thoracic and circumflex arteries, and the common scapula. We do not generally attend to them until after having secured the trunk of the axillary artery. If they should bleed too freely, or any circumstance compel us to protract the operation, each one of them may be tied as the knife divides them. As to omitting the ligature and depending upon the elbow of the lower flap to stop the hemorrhage, all the surgeons of the present day, say with Deccourelles, (*Manuel des Opérat.*, p. 391,) that we cannot trust ourselves to this.

Out of so many processes, there is no one which merits an exclusive preference, nor any one which may not effect the object we have in view. That of Le Dran is the best where the soft parts of the hollow of the axilla have alone preserved their normal condition. When, on the contrary, none of these tissues are healthy except at the stump of the shoulder, we are then compelled to have recourse to that of La Faye, as modified. If the disease should have extended farther upon each side than from above downwards, the process of Garengeot or Cline would be applicable. The circular method would become necessary where the skin had undergone degeneration around the whole limb, and as high up nearly as the articulation, and might be replaced by the ovalar method, if it should appear possible to save a little more of the tissues behind than in front. If the alteration has proceeded farther up on the outside than upon the inside, the process of Delpech would have its value. It would be the same with that of Sharp and Desault, or better still, with that of Laisne or M. Hello in the contrary case, provided the artery in the beginning has been avoided by the instrument, and, as has been said above, protected afterwards during the remainder of the operation. Finally, when the tissues are not more diseased on one side than on the other, but are more so in front or behind, it is advantageous to place the flaps vertically, and to give to each of them nearly the same length. We may then choose between the processes of M. Larrey, Bécord and M. Lisfranc. The mobility or immobility of the limb, the position in which it is found fixed by the disease, and the relations of the head of the humerus with the glenoid cavity, and the processes of the scapula, often also make one process preferable to another. But it is at the bedside that the skilful surgeon may or can appreciate these several indications. In a patient in whom the whole of the arm was occupied by a cancerous affection, I was obliged to employ the ovalar process reversed. The patient, nevertheless, got well.

Now, supposing that there is nothing in the state of the parts which compels us to adopt one process in preference to another, which is the method that offers the most advantages? In the transverse method, there exists between the acromion and the lower border of the glenoid cavity an excavation too deep and wide to enable us in approximating the base of the flaps, to fill it up completely, for the purpose of promoting easy union by the first intention. We should then unquestionably adopt such processes as procure a vertical cicatrix. The rapidity of that to which M. Lisfranc gives the preference, leaves nothing to desire. The process of Desault, reversed as it is by the modification of M. Larrey and Dupuytren, does not require a much greater length of time. The ovalar process, however, as it procures a wound infinitely more regular, though it exacts more address and more accurate anatomical knowledge, is, in my opinion, still preferable. By practice it ultimately becomes easy, and I have seen M. Chaumet, of Bordeaux, finish it in thirty seconds upon the dead body. I am not aware of any other than the circular method by the process of M. Cornuau, or that of my own, which are preferable to it, or can be substituted for it with advantage. All these variations in the operation, however, are of such trivial importance in practice, that it would be puerile to dwell upon them at the present day. The process of M. Mance and M. Lesseré (*Thèse* No. 57, Paris, 1831,) who recommended removing at the same time with the arm, one the acromion, the other the acromion-glenoid cavity and extremity of the clavicle, cannot be applicable unless the bones of the shoulder be actually diseased.

I have already remarked that the disarticulation of the shoulder is an extreme measure, and that we ought to reject the advice of those who, like La Faye, recommend that it should be performed even in cases where it might be dispensed with by applying the saw below the head of the humerus. It does not follow, nevertheless, formidable as it was first thought to be, that it is much more dangerous than amputation in the continuity. "We have so often performed, and seen performed successfully, extirpation of the arm," says M. Gouraud, "that we doubt if it is scarcely more dangerous than amputations between the articulations, and it is questionable, in fact, if in wounds from fire-arms it is not preferable to it." M. Bancel, in his Thesis, cites sixty successful cases. M. Larrey avers that he has found it succeed in ninety cases out of a hundred. Sabatier speaks in admiration of the success this surgeon had in fourteen cases out of seventeen; and Percy allows that out of seventy persons thus amputated, we lose only a sixth part. Immediate union is specially applicable to it, and for the subsequent treatment, the same precautions pointed out under amputations and operations in general are specially required, whether in relation to the dressings or the regimen, or to prevent visceral inflammations, moderate the general reaction, and protect ourselves against the consequences which too often result from capital operations.

[Dr. Stephen Smith, whose statistics of surgical operations are now so extensively known, published a very valuable paper in the *New York Journal of Medicine*, &c., January, 1853, in which he furnishes us with the following summary of the comparative results of amputations at the shoulder-joint, of the arm, and the thigh, performed in different Euro-



pean and American Hospitals.—Of 71 cases of amputation at the shoulder-joint, 34 died. Of 275 amputations of the arm, 103 died. Of 598 cases of the thigh, 279 died.

Mr. Guthrie's tables show an astonishing difference in the rate of mortality between the primary and secondary amputations at the shoulder joint. Thus, of 19 cases of secondary amputations, 15 died, whilst in the primary amputations, in 19 cases, but one died!

Of 40 cases in private practice, of American Surgeons, 13 were fatal, and one doubtful. In 7 cases, anæsthetics were used, and only one of these was fatal. G. C. B.]

#### ARTICLE VIII.—AMPUTATION OF THE SHOULDER.

##### § I.—*Indications.*

After amputation of the arm at the joint, it would seem that we could advance no farther upon the root of the limb for the purpose of its removal. Nevertheless, if the disease should have invaded a part of the shoulder as well as the arm; if the clavicle, acromion, coracoid process, and even the head of the scapula, should have all become implicated in the disorganization, what should the surgeon do? Should he remain a passive spectator of the progress of a fatal disease? The Samuel Wood mentioned by Cheselden, and the three other patients whose history is given by Carmichael, Dorsey and Mussey, (*Gaz. Méd. de Paris*, 1838, p. 394,) had the shoulder entirely torn off, and nevertheless got well! M. Larrey, (Carteron, *Bulletin de la Fac. de Méd.*, t. IV., p. 218,) in his campaigns, has frequently been obliged to remove with the arm a large portion of the scapula or clavicle, and more than on one occasion has success rewarded his courage. After having disarticulated the arm, M. Clot believed it to be necessary to remove also the neck of the scapula, and his patient recovered, (*Lancette Française*, t. IV., p. 84.) In 1808, moreover, M. Cuming, (*Bull. de Férussac*, t. XXII., p. 91,) at the Hospital of Antigua, [Antigua?] removed the whole of the shoulder, with the arm, in a patient who recovered perfectly. Since then, M. Brice, in the year 1827, was equally fortunate with M. Clot, in removing a portion of the clavicle and scapula at the same time with the arm, in a Greek soldier with a gun-shot wound. Amputation of the shoulder may also become necessary in order to save the arm. Janson has given an example of this kind. I find a second case in the thesis of M. Piedagnel (*Thèse* No. 250, Paris, 1827) which belongs to Beauchêne. A third belongs to M. Lueke, (*Bull. de Fér.*, t. XXII., p. 89,) who performed the operation in 1828, as will be mentioned elsewhere. Bonfils and M. Gensoul (*Journal des Hôpitaux de Lyon*, p. 97—100) have each removed the shoulder for a cancerous tumor, once, and M. Syme (*Edinb. Med. and Surg. Journ.*, October, 1836) had a case which recovered after he had removed the acromion, glenoid cavity, and corresponding portion of the clavicle, as M. Hunt (*American Med. Recorder*, Vol. I., 1818) had already done in a patient forty-six years of age, who had already undergone amputation of the hand, and afterwards disarticulation of the arm for the same disease. M. Mussey also (*Gaz. Méd. de Paris*, 1838, p. 394) was obliged in one case to extirpate the

entire shoulder, and the patient recovered. (See *Exsection of the Shoulder*, farther on.)

This amputation is sometimes required in cases of necrosis, caries, and comminuted fracture, with more or less extensive disorganization of the soft parts, because simple disarticulation of the arm would not allow of our removing the whole disease. At other times, it is required for some degeneration, or for a tumor composed of abnormal tissues, and which includes a part of the arm, and extends beyond the joint. Again, the tumor and morbid degeneration may involve only the scapula and the tissues that surround it; in such cases we may preserve the arm.

## § II.—*Operative Process.*

A. *First Case.*—We lay bare the diseased bones until we come to the sound parts; the flaps, formed and managed as in amputation of the joint, are also cut out in this or that manner, according to the state of the tissues, and then reversed and held by assistants; if it should appear impossible to avoid the artery, we then make pressure upon it on the first rib, should it not seem more advisable to apply the ligature to it at the outset. If it should become necessary to remove the three projections which terminate the scapula in front, the saw should be applied behind the root of the coracoid process, or on the outer side of the spine of the scapula, in order to remove the whole at a single cut. When only one of them is diseased, either the acromion, the glenoid cavity or the coracoid process, it is better to saw from without inwards, or from behind forwards; whilst the outer extremity of the clavicle requires that we should saw from before backwards, or from above downwards. It is unnecessary to remark, that in order to accomplish these different kinds of sections in a proper manner, we should make use of a saw similar to that generally used for the section of small bones, or the chain saw of Jeffray. Upon the supposition that there are only some splinters or fragments of bone which may easily be removed from above the joint, we must confine ourselves to extracting these, and to the processes for disarticulation of the arm.

B. *Second Case.*—As the form, size, and precise seat of the tumor in these cases can have no fixed relations, it is, for the same reason, difficult to trace out the rules for such an operation. It is, by falling back on his intimate knowledge of the parts, and the resources of his own mind, that the surgeon will be enabled to determine the precepts which should then guide him. In the year 1825, there were received at the Hospital of Perfectionnement, at the same time, two men, having enormous colloid tumors upon the shoulder. One died without being operated upon, and the examination, after death, showed that the two upper thirds of the humerus, and the greater part of the tissues that envelope it, together with the anterior half of the bones of the shoulder, were replaced by a lobulated, whitish mass, as friable as the texture of an apple or a green pear. M. Roux, with a desire to save the other, operated upon him Dec. 6, in presence of M. Marjolin, and a great number of students. The tumor which had existed four years, occupied the right arm, was double the size of the head of an adult, and of an ovate form with the point descending nearly down to the elbow, and its

base prolonged as high up as to the root of the acromion. The patient was 54 years of age, strong, of good constitution, and in full vigor, and there was no indication that any of the viscera were affected.

The first flap was circumscribed by a semilunar incision, with its convexity in front, and extending from the middle of the spine of the scapula to below the anterior border of the axilla; two branches of the acromial artery being opened, they bled freely, and I compressed them with the fingers. A second flap, corresponding in its base to the infraspinous fossa, and of the same form as the preceding, was then cut upon the outside and behind; a branch of the common scapular artery of considerable size being divided, it was immediately stopped by the finger. It was deemed proper to excise the acromion in order to continue the dissection of the diseased mass with greater facility; threads were applied upon various small arteries, and the incisions continued down to the clavicle and glenoid cavity. These two portions of bone were immediately removed by the saw. After a protracted search, the axillary artery was at last found. The tumor now was held only by a loose pedicle, which included the vessels, and which I seized with my two hands in order to enable M. Roux to complete the removal of the limb without danger. Finally, the operator returning in search of the remains of the tumor, removed also with his saw the coracoid process, and the anterior fourth of the scapula.

Although the patient did not lose more than twelve ounces of blood, he became pale and seemed greatly prostrated. During the day he remained very comfortable, but the night passed without sleep. On the 7th, in the morning, the pulse continued small, the chest constricted, and a cold sweat was remarked upon his face, which retained its paleness; but there was no actual suffering. This state of exhaustion gradually increasing, death supervened on the 9th, at 7 in the morning, without being preceded by delirium or any commotion.

The necropsy exhibited nothing which could explain this result, which was as fatal as it was rapid. The tumor weighed twelve pounds; a plaster cast of it was carefully taken, which should be found in the museum of the Faculty, where I deposited it.

This kind of tumor, moreover, is very common. It gives to the limb a shoulder-of-mutton form. Pelletan has noticed it, and Hey has given a plate of one. The tumor in the patient of M. Gensoul, and also of that of M. Syme, was similar to this. I have seen three other cases, and I could easily enumerate here twenty examples of the same kind. In the haunch I have seen two cases of it: one, a Polish officer, who went to Bordeaux, and died there; and the other, a young man who died at La Charité; in this last the tumor weighed over thirty pounds. A patient, in whom I removed the arm, with the acromion also, had this tumor. Belonging, as they do, to the class of encephaloidal tumors, the tissue which composes them is reproduced with frightful rapidity.

C. *Third Case.*—So also where the scapula alone and its dependencies are affected, a definite rule for proceeding is wanting; for some times the tumor is wholly on the outside of this bone, sometimes on the inside, while in other cases it projects from both its two surfaces, comprising to a greater or less degree its whole substance. On the other hand, it is evident that the disease, in place of a morbid, external growth,



consist of an extensive degeneration of the bones. (See Exsection of the Shoulder, *infra*.)

[DISARTICULATION OF THE SCAPULA AND ARM TOGETHER.—AVULSION.

The possible DISARTICULATION OF THE SCAPULA,—if such a phrase is allowable,—becomes a matter worthy of consideration from the new facts, of late years, upon the subject of limbs torn from the body.

The subject of AVULSION of the Limbs, at the articulations, generally caused by persons getting entangled, or suddenly drawn into portions of machinery, in manufactories, going with great rapidity, is one that has, within a few years, attracted considerable attention, while the recoveries from such frightful lacerations have led to some curious and, as it seems to us, important pathological results for surgery. One of the most recent and terrific cases on record, which *recovered*, is related by A. King, M. D., of Glasgow, (*Cormack's Lond. & Edinburg Monthly Journal of Med. Science*, Feb. 1845, p. 96, &c.) The patient, a stout boy, æt. 15, had his *whole left arm, with the scapula entire, torn off*, by his hand being caught in the wheels of a grain-mill, Oct. 10, 1843, leaving a jagged, irregular, and ghastly wound, commencing an inch from the sternal extremity of the left clavicle, and coursing along the under third of the neck, thence downwards, forwards, and backwards, terminating at the fourth false rib anteriorly and laterally, and three inches on the *right side* of the upper portion of the dorsal division of the vertebral column posteriorly. The loss of integument was chiefly behind and below the situation of the left clavicle. The *muscles* on the front and side of the *chest*, with the *exception of a very few fibres*, were removed, *exposing the intercostals*; they had been dragged from their thoracic attachments, leaving the skin loose and puckered, as if too ample for the subjacent textures. *No fragment of the scapula* could be discovered in its situation. The clavicle was drawn downwards and forwards, but maintained its connection with the sternum. The *axillary artery* projected from beneath the displaced clavicle, to the *extent of two inches and a half*, and pulsed strongly to within an inch of its orifice, but gave exit to no blood. (On a minute examination of the torn orifices, the *external coat* of the vessel was found to be divided into three irregular pieces which encircled each other and held in their *embrace a small coagulum of blood*. There was *no venous hemorrhage, and no large venous trunk discovered*. The nerves were torn at irregular distances, varying from three to five inches from the surface of the wound; their extremities were *greatly attenuated*, and the *slightest* irritation upon them gave rise to the most acute suffering. The artery was secured by a ligature, being deemed, as it certainly was, the most prudent course, for it would hardly have been otherwise than an act of unwarrantable temerity to have looked for its cicatrization after the *torsion* which had been effected or forced upon it, by the violence of the accident. About two inches of the projecting portion of the clavicle was *sawn off*, and the integuments were drawn together by adhesive plaster, which was made to cover without any stretching, the vessels, nerves, and indeed the whole wounded surface, with the exception of a small, irregular portion near the spine, about three inches in circumference. The patient did not even

swoon, but was found *standing by the wheels*, which had been promptly stopped ; and not until his tattered clothes, adhering with his torn-off shoulder and arm to the machinery, were being removed, did he evince even pain, and then complained but little. Not two cups of blood, in all, were found on the floor, and on the arrival of the surgeon, half an hour after the accident, not *a drop of blood* oozed from the frightful wound ! Nor was there any hemorrhage afterwards. The reaction was trifling, and appeared to be only what was required by nature to restore tone to the system from so violent a concussion. The pulse continued for several weeks steadily at, or a little over, 130 in a minute, and soft and of moderate strength—the tongue clean, skin cool, and appetite good, and patient lively. The continued celerity of the pulse, in fact, might, as we think, be readily accounted for by so *great a destruction and sudden ablation of parts, without hemorrhage*, which thus accumulated or concentrated just in the same proportion to this loss of substance the nutritive powers left in the circulation, and therefore the quantity of blood in the whole system ; requiring consequently its more rapid passage through the heart and lungs. On the tenth day several portions of the integuments which had been brought over the face of the nerves, and some of the ragged margins of the wound had separated by sloughing ; but healthy granulations were springing up on all sides. The plexus of nerves, which had become exposed to the extent of three inches, lay together in a mass, and were partly sphacelous ; but when touched by the dressings, or otherwise, the boy manifested a degree of terror, says the surgeon, I have seldom seen equalled, and declared he would sooner perish than allow any interference. The ligature lay in contact with the nervous mass, and in consequence of the extreme sensibility of the part, was allowed to drop off with the sphacelated nerves, *about the middle of the sixth week*, after the boy had been walking about for some days in perfect health. A dissection of the torn off limb and scapula exhibited a fracture midway on the humerus,—the integuments on the outside of the head of the humerus entire, but on the inner and anterior surface of the bone, completely removed, and the nerves and blood-vessels exposed,—the nerves torn and separated into small bundles like pieces of cord, some  $5\frac{1}{2}$  inches long, and the shortest one inch from the shoulder joint,—the artery (the *brachial*) torn directly across, about two inches on the distal side of the shoulder-joint, and looking as if severed by a cutting instrument,—the internal and middle coats, on being laid open, presenting the appearance of being slightly retracted and puckered,—the acromion and coracoid processes of the scapula entire, but the *other portions* of the bone (scapula) so mutilated and crushed to minute fragments, with the surrounding muscles, that they could not be distinguished from each other.

Dr. King draws attention to the leading feature of the absence of hemorrhage, and the trifling shock on the system produced by so immense and lacerated a wound, unaccompanied, it may be said, even with syncope, and at no time stupor or fever, strictly so called. Such slight morbid effects from such terrible violence, which have been frequently noticed also in similar cases, lead to the supposition that, could disarticulation, thus almost instantaneously accomplished by a natural application of mechanic force, rapid and as it were spontaneous, while the

patient has scarcely time to be conscious of the operation, be thus performed intentionally and by art, and limbs thus quickly wrung or twisted off from their joints, there would be less to be apprehended from consecutive symptoms, than after the most dexterous application of surgical instruments. The general arguments, also, advanced of late years with so much earnestness by Amussat and others, in favor of *torsion* of arteries (see vol. I. of this present Amer. ed. of Velpeau; also this vol. II.) in preference to ligatures, seem to acquire great weight from details like those of the above remarkable, not to say almost marvellous and incredible, case; for herein *torsion* was certainly exercised on a vast extent of surface and upon a gigantic scale as to the great trunks interested. In truth, the first ideas of torsion as a surgical expedient unquestionably came from the almost total absence of hemorrhage in such wounds, and which dissection, as is seen in this case, proved to have been effected by the same breaking and rolling up of the two inner coats and the resistance and preserved integrity of the outer elastic coat, which are shown to be the results where arteries are submitted to torsion by a surgical instrument. Dr. King finds but a very few cases of avulsion on record. Belchier, (*Philosophical Transactions*, vol. XI., p. 313,) relating the case of the man who had the arm and shoulder-blade torn off by a mill, says he was not sensible of any pain, but only a tingling about the wound; and actually did not know his limb was torn off, till he saw it in the wheel! and soon recovering from his pain, or rather fright at this loss, came down a narrow ladder to the first floor of the mill! The boy described by Mr. Carter, (*Medical Facts*, vol. II., p. 18,) whose left leg and thigh and part of the scrotum were torn off by a slitting-mill, was found by the surgeon lying on the floor under a blanket, seemingly free from pain, and only anxious because his parents would be in such trouble! The same in the boy aged nine, whose leg M. Benomont (*Hist. de l'Acad. de Chir.*, t. II., p. 79) states was torn off at the knee by the wheel of a carriage, but whose only trouble was an anticipated reprimand from his parents. The girl aged eleven years, described by Dr. Clough, (*Memoirs of the Medical Society of London*, vol. III., p. 519,) had strength to walk across the court, from the coach to the hospital, shortly after her humerus had been torn from the scapula in a mill. Two other cases (*Traité Complet des Accouchem.*, par M. De la Motte, Obs. CCCXLI.; see also Dr. Cooper's case, *New York Jour. of Medicine*, vol. I., p. 284) are too imperfectly given to allow of more than merely this reference to them. In one case only, that of a child as related by M. Carmichael, (*Medical Commentaries*, vol. V., p. 80,) the avulsion of the left arm by a mill, though the patient recovered a little and spoke, was soon followed, but without any loss of blood, by cold extremities, low tremulous pulse, and convulsions over the whole right side of the body and face.

In one case only, also, of the above was there profuse hemorrhage: viz., in that of Belchier, (*Loc. cit.*, p. 314; also *Cheselden's Anatomy*, p. 321.)

Dr. Jones (*Jones on Hemorrhage*, p. 42, cap. XII.) has clearly shown, in his valuable experiments, that in these lacerations, which is seen also, says Dr. King, in the natural instinctive act of brute animals in bruising the umbilical cord, nature providentially guards against the loss of blood.



The brittle, internal coats of the vessels give way, and their retracted *debris* fill up the outer, firmer, elastic coat, and this plugging up of the vessel, (see *Costello's Encyclop.*, part V., art. *Avulsion*,) and also the now elongated *conical* narrow orifice of the external coat, all resisting the force of the circulation, naturally favor the deposition of coagulum lymph, and consequently, cicatrization. These are now the most approved views, and more recent observations have shown that the important part in this process is rather in the mechanical breaking, rolling, and pushing up of the two inner coats, (as in torsion,) than in the deposition of lymph, as Dr. Jones imagined. [See notes *supra*, under arteries, &c.]

In the case of Dr. King, he justly remarks, as we think, that the lacerated fragments of the nerves exposed should have been immediately removed by the knife, which would have greatly diminished the present suffering, and danger of neuralgia afterwards. So should lacerated and contused portions of cellular tissue and fibre be removed by the knife to avoid sloughing and suppuration; but in this case there were no such parts, as the whole mass appears to have been whipped off, smack and smooth, down to the ribs!

It is true, as Dr. King says, that we see only the favorable side probably of most such cases, to wit, the fortunate ones, while the fatal results are hushed up. But it must be confessed that their phenomena, viewed in any light, are pregnant with important reflections, and lead, as in this case of Dr. King especially, to the conclusion almost irresistible, that the *entire scapula* and its *muscles* in front and much of those behind, together with the arm and a section also of the clavicle may be removed from the body and be followed notwithstanding by a perfect restoration of health. It is difficult to conceive how such a terrible and extensive destruction of soft parts, muscular tissues, vessels and nerves, and exposure of aponeurotic, cartilaginous and synovial surfaces and sheaths could have so resulted, and with scarcely any constitutional disturbance. It would seem to give a less formidable aspect to lacerated wounds than that in which they are usually regarded; though there is no question scarcely in our mind that a smooth incision or separation with the knife, could it have been made in the proper directions and at the proper places of division, as in those which nature herself for example had selected in this violent disrapture, the result would have been attended with less danger of a fatal issue and better prospects of cure. The natural and best line of division of the parts, however, for the most perfect torsion of the vessels, is doubtless the one here rudely adopted in such accidents. And the question therefore comes back to this, how far nature in such violence is to be imitated by surgical art in attempting, in cases that may offer, such scapular disarticulations as the foregoing, and whether these are not to be considered valuable lessons in pointing out to us the path by no means yet wholly explored, where (as in anaplastic operations) unachieved triumphs that we can scarcely anticipate are still in store for surgery, so far as enormous destructions, ablation and restitution of parts are possible without loss of life.

Some consideration is undoubtedly to be attached to the extreme and almost instantaneous rapidity with which such ablations are effected. This unquestionably has great and favorable influence upon the results, and it is to be received in some sort as an argument in favor of the

once highly lauded but now universally reprobated achievement, which most surgeons plumed themselves upon, of completing the most bloody operations within a limited number of seconds.

We notice some remarks on the above important case of Dr. King, made at a meeting of the Medico-Chirurgical Society of Edinburgh, Jan. 22, 1845, (*Cormack's Jour., ib.*) Dr. Watson on that occasion justly doubted that the slight hemorrhage in such cases depended on the formation of a *clot*, as it required according to his experiments *seven days* to form in a deligated artery. It was well observed by Dr. Douglass MacLagan that the art of *avulsion* was in the highest degree favorable to the interruption of the course of the blood, as he had proved many years since by experiments on the dead human subject and in living animals, in association with Prof. Turner. In dragging out arteries forcibly, until they gave way, the same result was produced, viz., the *cone-like prolongation of the tube*, and the shaping of it into the form of a *pencil, pointed for writing*. The prolonged outer coat formed the apex of the cone; the inner coat was retracted within and projecting into the canal. This strengthens greatly the now received opinion that the actual plugging up of the artery by this species of *membranous tamponing*, has in fact, as seen in torsion, much more to do with the arrestation of the blood than has the formation or deposit of a clot of lymph. The clot alone, however, may be the *tampon*, as it would appear by the late interesting experiments of M. Amussat, (see our note on these, *supra*,) which plugs up the cut extremities of an artery, causing thereby a spontaneous cessation of the hemorrhage. It is also a matter for reflection how far avulsion is to be copied in using torsion on arteries. It would seem reasonable to suppose that torsion, so far as it respects the continued twisting or *revolving* of the artery round upon its long axis, by means of the forceps used, is too much insisted upon, and might injure and rupture in various places the important outer tunic; and consequently that the first step in the process, viz., that of endeavoring to break up the two inner coats and to push them towards the cardiac side, is the point to be most attended to; or that this last in fact is less important than the simple act of *elongating* the artery by the forceps in the left hand, inasmuch as it would appear that this elongation itself, with little or no torsion, suffices to rupture the inner coats and to bring the outer elastic tunic like a *hood or cap* well over them as the inner ones retract. This it might naturally be supposed it would do from the elastic external tunic submitting so readily to this traction, while the middle tunic, by the natural contractile action of its fibres and the brittleness of the inner coat, seem more disposed to recede or retract within the outer coat. In the living body, however, this elongating traction must necessarily be exercised with caution, inasmuch as a rupture of the trunk high up within the tissues might be attended with serious consequences.

*Actual Amputation of Scapula, &c.*—In proof of the practicability of removing the scapula, as we have said in our remarks on the extraordinary case of Dr. King above, the *entire scapula*, together with the *external extremity of the clavicle*, have been subsequently amputated with complete success by Professor Rigaud of Strasbourg (*Séance of the Acad. of Sciences of Paris*, July 15, 1844.—*Gaz. Méd. de Paris*,

Tom. XII., 1844, p. 469) in an old soldier aged 51, for an osseous tumor which formed on the anterior angle of the left scapula; but it was only the scapula itself with its clavicular attachment which were removed, and not until at the expiration of eight months after the Professor had previously taken off the arm of the same side at the scapulo-humeral articulation for a tumor on its upper portion. M. Rigaud sent casts of the parts to the Academy at Paris. T.]

## CHAPTER II.

### THE LOWER EXTREMITY.

Amputations in general are more difficult and serious in the lower than in the upper extremities. They are performed also on the foot, leg, and thigh, and in the continuity as well as contiguity.

#### ARTICLE I.—AMPUTATION OF EACH TOE.

The case is not the same with the toes as with the fingers. The uses of the latter render their preservation important, and their length allows of their partial amputation. The toes on the contrary, serving only for standing upon, and having but little extent, may be entirely removed without essentially impairing the functions of the foot. Nor do we scarcely ever amputate for one or two phalanges of the toes, or in the continuity of the metatarsal phalanx. Of these the first toe alone might form an exception to the rule, upon the supposition that its last phalanx was affected in such manner as to allow of our saving a sufficiency of the soft parts to form a suitable flap.

A. *The Great Toe.*—The first toe seems to be an exception to the general rule, under another point of view. From the time of Le Dran (*Opérat.*, p. 569—*Observ.*, t. II., p. 369) to the present day, most surgeons have preferred dividing the metatarsal bone behind its head, rather than restrict themselves to separating the great toe from it. In disarticulating this toe, we create, it is asserted, a disgusting deformity; the anterior extremity of the bone forms a considerable projection, which is difficult to cover, is liable to painful friction against the shoes, and must in fact only interfere with instead of assisting in the functions of the foot. It is certain that the deformity is less observable after the amputation of the first metatarsal bone than after the removal of the toe only; but it is also undeniable that the power of standing is much more difficult and less secure in the first case than in the second; that this bony prominence which we desire to get rid of, is of the greatest utility, that it hinders the foot from turning inwards and gives a firmer basis to the support of the frame. Under this point of view then, amputation of the great toe alone ought to have the preference.

I have disarticulated the first toe both by the flap and the ovalar method. If the disease occupies the phalangeal articulation only, I



make a circular incision behind it, and divide the first phalanx in its continuity, either with the cutting forceps or Liston's nippers.

In making flaps upon the sides in disarticulating this toe, it is necessary to give them a considerable degree of length, and it seldom happens that we are not interfered with underneath by the sessamoid bones. The ovalar method taking all things into view, is the preferable one; but in performing it the surgeon should take care not to go too far behind on the plantar surface of the foot. The sessamoid bones, prolonged as they are under the head of the metatarsal bone, would give him considerable annoyance, if he did not take the precaution to immediately bring back the bistoury in front under the border of the phalanx.

B. *The Little Toes*.—If it should happen that one of these toes was affected only at its extremity, there would be two reasons to justify amputation as far from the metatarsus as possible; 1, the obligation to remove nothing which gives support to the body; 2, the advantage of avoiding the sheath of the flexor tendons. In a boy, aged nine years, I removed in this manner the last phalanx for an exostosis accompanied with fungous ulceration of the ungual surface of the third toe. In another case I removed that of the second toe, and in a third, that of the first. The operation presented no difficulty in any of them, and in the first the wound healed perfectly by first intention. No other scarcely but the flap method from the dorsum to the plantar surface can be applicable in such cases. The pulp of the toe furnishes a cushion which can be readily raised up and which closes the wound exceedingly well.

C. As the *processes* to be followed, moreover, are precisely similar to those which have been described for the removal of the fingers, there can be no necessity of recapitulating them here. I will remark only that the natural cavity which corresponds to the dorsal surface of the metatarso-phalangeal articulations, and the prominence which the plantar surface forms in front and underneath, render amputation of each toe in its totality somewhat more difficult than that of the fingers, and that the ovalar method possesses still greater advantages for the appendages of the foot than for those of the hand.

D. The disarticulation of either of the three middle toes, scarcely produces the slightest alteration in the form of the foot. A young girl and a young man, in whom I had removed one of these toes, in consequence of a caries, earnestly desired me to do the same on the other side, in order, they said, that they might have the two feet equally narrow! We shall see farther on what course in this respect is to be adopted for the first and fifth toe;

#### ARTICLE II.—AMPUTATION OF SEVERAL OF THE TOES AT ONCE.

Amputation of two, three, or of all the five toes could also be performed in the same way as for the fingers. It would be neither more complicated nor more difficult, and would present the same chances of success. There are so few wounds so serious as to implicate all the toes, without affecting at the same time a greater or less extent of the metatarsus, that the proposition made about twenty years since to amputate several of them at once appeared to be new, (Gautheret, *Thèse*, 1820.) Examples, however, had been related of such amputations,

and especially in cases of frost-bite. [See a note on this subject, Vol. I., Introduction. T.] A boy, aged sixteen years, was operated upon in this manner by Garengéot, (*Opérat.*, t. III., p. 416.) Also in the case of another boy a similar operation was performed at the hospital of Padua, (*Biblioth. de Planque*, t. II., p. 389, in quarto.) In one patient Bloch (*Biblioth. Chir. du Nord*, 116) performed this operation on both feet. In another case Delatouche (*Thèse*, Strasbourg, p. 5, obs. 12, 1814) says they were amputated completely by a bullet, and that no consecutive accident took place. M. Baud and M. Scoutetten (*Arch. Gén. de Méd.*, t. XIII., p. 67) have also both performed this operation with success. I have amputated, says M. Champion, all the toes in two soldiers, who were frost-bitten, always keeping in view to preserve to the foot, even if it were but a single phalanx, the greatest degree of support possible for the body. I saw at La Pitié, a patient operated upon in this manner by Lachapelle, more than forty years since. I have met with two other similar cases during the wars of the Empire. A recent case also has been published by M. Chaumet, (*Journ. Hebdom.*, t. III., p. 83.)

### ARTICLE III.—AMPUTATION OF THE METATARSUS.

The bones of the metatarsus are amputated like those of the metacarpus, and by as many different processes, either in the continuity or contiguity, or separately or all together, of which many examples have been given by Hey, C. Bell, Langenbeck, Ferrand, Desault, Laumonier, MM. Moreau, Daniel, Aubry, &c. They may also be removed by extraction or evulsion, while at the same time preserving the corresponding toe.

#### § I.—Amputation of the Bones of the Metatarsus separately.

A. Amputation of the three *middle metatarsal bones* is performed quite frequently, and always after the same rules as for the amputation of the corresponding metacarpal bones. Some surgeons maintain even that it should have the preference over simple disarticulation of the toes. M. Thomas, for example, with whose opinion M. Petrequin (*Gaz. Méd.*, 1837, p. 367) seems partially to coincide, maintained in 1814 that it is less difficult and less dangerous than this last, and that the deformity which results from it is also less striking. This is evidently an error.

I. To remove any one of the middle bones of the metatarsus by the *ancient method*, it is necessary to divide by two successive incisions the whole thickness of the sole of the foot, to disturb some of the tarso-metatarsal articulations, and to produce a very extensive wound; while the amputation of a toe, performed as it is in an instant, makes only a very trifling wound and one which is easier healed. Thus in the foot as in the hand, and for the same reasons, we must not attack the bones of the metatarsus only so far as it may be found impracticable to remove the whole of the disease by disarticulating the toes.

II. *Process of the Author.*—When this operation becomes necessary it is easily performed by the following process which I have already

described under amputation of the bones of the metacarpus. I encompass the root of the toe with an oval incision, whose extremity is prolonged backwards upon the dorsum of the foot to beyond the limits of the disease. Afterwards detaching the soft parts upon each side and then underneath, I have soon isolated the bone, which I exsect with Liston's pliers, without dividing the sole of the foot, and which thus exhibits no trace of any cicatrix after the cure.

The three patients upon whom I operated in this manner rapidly recovered, and scarcely any traces of the mutilation were perceptible!

*B. Amputation of the First Bone of the Metatarsus.*—Some practitioners, and among them M. Gouraud, maintain that it is better to *disarticulate* the first bone of the metatarsus than to divide it with the saw. Ledran had already pointed out the disadvantages of this method while endeavoring to give popularity to the other, which has been generally adopted ever since M. Richerand recommended to saw the bone slantingly, or taperingly,) in place of making the section transversely as was done in the last century. After disarticulation, the base of the wound represents a capital L, whose horizontal branch formed by the first cuneiform bone makes a disagreeable projection on the inner border of the foot. The operation is besides more difficult, and the wound less easy to unite by first intention. Amputation in the continuity, when we take care to make the saw act in a very oblique direction from behind forwards, leaves no prominence on the inner side of the bone. It does not require so great a destruction of parts, nor that we should attack any articulation. I am of opinion, therefore, that it ought to have the preference so long as the disease does not oblige us to carry the instrument up to the tarsus. I have had every reason to be satisfied with these rules.

*I. Ordinary Processes.*—The different processes pointed out for the thumb and first bone of the metacarpus, are applicable to the metatarsal bone of the great toe. It was in these cases that Lebas (*Bulletin de la Faculté*, t. V., p. 417-490) and Bœlard at first made use of the ovalar method, that Richerand employed the V incision, and where the flap methods have also frequently been made trial of; but none of these methods have satisfied me in practice. These, then, are the processes which I have followed:—

II. As it is difficult to draw the soft parts sufficiently inwards from the plantar surface of the foot, and to plunge in the bistoury form above downwards, between the bone and the muscles; as it is almost impossible, moreover, in proceeding in this manner, to give to the point of the flap the regularity, width, and length desirable, I prefer making my incision from without inwards, and to trace out its extent and form by dividing the skin from behind forwards, first on the dorsal surface, then on the plantar surface nearly as far as the anterior extremity of the first phalanx of the great toe, and afterwards to raise up and dissect this flap while reversing it from its apex to its base. Having incised the integuments of the commissure in such manner that the borders of the whole wound pass outside of the head of the bone, we plunge the knife through the first inter-osseous space, while an assistant also draws the integuments outwardly as much as possible. We then divide the tissues with the full edge of the blade from behind forwards,



bringing the knife out by the commissure of the two first toes. The knife being then immediately replaced behind, we divide above and underneath, on the inner and outer side, all the tissues which may be still adherent to the bone. A piece of wood or pasteboard, or even a simple compress folded several times and placed in the bottom of the wound, protects the soft parts against the action of the saw. The operator seizes with his left hand the toe and the articular extremity which he intends to remove, causes the foot to be turned outwards, applies his nail to the point where he wishes to begin the section, and then, with a small saw in his right hand, divides the bone at a very acute angle from its inner to its outer surface and from behind forwards.

One of the dorsal or inter-osseous arteries of the metatarsus, or one or two branches of the plantar arteries, occasionally, but not always, require the application of the ligature; the flap now brought upon the wound, should be adjusted to it accurately, and supported by strips of adhesive plaster and a suitable bandage.

III. *New Process.*—When the plantar surface of the foot is not too much degenerated, I proceed in another manner. An incision, to be carried along the inner border of the bone from the line of its posterior articulation as far as in front of the infra-phalangeal prominence, enables us to detach, horizontally from above downwards, from within outwards, and slightly from before backwards, the whole thickness of the sole of the foot, and to form in this manner a flap which remains adherent in the whole extent of its outer border. A second incision, carried from one extreme to the other of the first, by crossing very obliquely the dorsal surface of the bone, and in such manner as to fall upon the first inter-digital commissure, then enables us to terminate the operation as in the process described above. We have thus a very regular wound, and a thick, large flap, which does not implicate the sole of the foot, and which moulds itself exactly to the fibular side of the wound. It is a method whose results in practice are of the most satisfactory character, and one which I recommend to the profession.

C. *Fifth Metatarsal Bone.*—The last bone of the metatarsus might, like the others, be amputated in its continuity; but the projection which it forms behind, the uselessness of any portion of it that we might preserve, the ease with which it can be disarticulated, and the little deformity that results from it, are the reasons why we generally prefer amputating it in the contiguity. This amputation is not to be made like the preceding; the ovalar method is better adapted to it. If, however, we should not incline to make trial of this, we ought, with the bistoury held vertically, to cut through the whole inter-osseal space from before backwards, from the commissure of the fourth and fifth toes to the anterior face of the cuboidal bone; then disarticulate the bone, pass from its dorsal to its plantar surface, detach its head, and cut a flap of sufficient length at the expense of the soft parts upon the outer border of the foot, and which flap can be made to cover with ease the whole extent of the solution of continuity.

## § II.—*Amputation of the Metatarsal Bones together.*

Though down to the time of Chopart surgeons were in the habit of

having recourse to amputation of the leg for diseases even which did not complicate the whole of the foot, they not unfrequently, however, confined themselves to the partial removal of this part, which, at the present time, it is the prescribed rule to amputate as near the toes as possible.

I. According to Fabricius of Hilden, amputation of the metatarsus could not have been unknown to the ancients, who performed it with the chisel and mallet, and, without doubt, only in its continuity. In recommending it, Sharp (*Opér. de Chir.*, p. 390) advises that we should use a small saw, and states that he has once seen it performed with success. Hey revived it again at the end of the last century, and gives the case of a young woman, in whom he removed the first four toes, with a large portion of the corresponding metatarsal bones; but he complains of the great length of time which the wound took to cicatrize. The operation is easier upon young persons, because, during infancy and in this part, the bistoury may very often be substituted for the saw. M. Raoult, in 1803, and M. Thomas, in 1814, recommended this operation in their theses, supporting it, as it appears to me, on very good arguments. In 1828, Murat and M. J. Colquet (*Journ. Hebd.*, t. IV., p. 43) found that this operation fully answered their expectations. Since that time, M. Pezerat (*Journ. Compl. des Sc. Méd.*, t. XXXIII.) has performed it once, and with success; and M. Mayor (*Journ. des Connaiss. Méd. Chir.*, t. I., p. 138) who has also given his sanction to it, has been equally well satisfied with it. I cannot, in fact, understand why the transverse section of the metatarsus, rather than its disarticulation, should not have the preference whenever the disease admits of this operation.

I will also add that the first of these operations, if had recourse to in proper time, would, as it appears to me, render the other rarely necessary.

II. *Operative Process.*—a. A flap of the soft parts of greater or less length, is first cut, at the expense of the sole of the foot, by plunging a small knife into this part from one border to the other. We then divide by a semi-circular incision inclined slightly forward the skin and tendons of the dorsal surface at some lines in front of the point where we design to apply the saw. These soft part (les chairs) being drawn back by an assistant, the surgeon, one after another, denudes the bones with his bistoury up to the base of the flap, in order to effect with greater ease their simultaneous or successive section from one side to the other, or from the dorsum to the plantar surface of the foot.

b. The process of M. Pezerat, which consists in making three flaps, one dorsal, one plantar, and the other on the inner border, ought not to be adopted, unless the diseased condition of the parts renders it impossible to employ the preceding process.

c. In concurrence with M. Clampon (*Thèse, Resect. des Os, etc.*, 1815) and M. Mayor, it should, in my opinion, be adhered to as a rule to divide the bones as far as possible from the leg. A dorsal and a plantar flap of equal length, and even the circular incision, or the making one of the flaps shorter or longer, or the cutting out of two or three or four flaps instead of one, should be preferred, if the state of the soft parts seem to require it. Liston's pliers might also be advantageously

substituted for the ordinary saw, and the dressing would require no special precautions.

[*Amputation of the Metatarsal Bones.*—Mr. Smye (Cormack's *Lond. and Edinb. Monthly Journ.*, &c., Feb. 1843, p. 94,) speaks of M. Liston's "happy employment" of straight cutting pliers, in excisions of the metatarsal and other small bones, instead of variously formed saws previously in use, as if it were something new in surgery. We are of opinion that the germ of this instrument is far more ancient than might be supposed, and an argument in favor of this is, that in early times when strength, and immediate and obvious adaptation to the purposes in view, and not skill and adroitness, were most looked to, some such coarse, rude, but valuable article as, for example, the common cutting nippers of a blacksmith, to cut off, in an instant, protruded necrosed metatarsal and metacarpal bones, and those of the phalanges, would rather have been resorted to than the tedious, painful processes of sawing.

Certain it is, (see Vol. I., Prefatory matter,) a similar instrument to Mr. Liston's was constantly employed by me in the years 1831, '32, '33, at the Hospital of the Seamen's Retreat, New-York, for one or all the metatarso-phalangeal extremities of the metatarsal bones, in cases of necrosis, from having been frost-bitten, and which had been in some instances, *maltreated* by poulticing, &c. The bones, as I have said, were thus unsparingly clipped off, until the bleeding, excised surface of their extremities presented a fresh red and healthy appearance, though now buried half an inch or more in the tissues, and until the healthy appearance of the soft parts also indicated that the sections were made at the proper place. The soundness of this practice was made manifest by a fine, healthy stump, which was thereby procured without any trouble or danger of incising or dissecting the tissues for flaps, the necessity of which was superseded by excising the bones deep in the tissues; these latter, of course, in cases of frost-bite, as no constitutional taint exists, being rarely degenerated as far back as the bones. T.]

#### ARTICLE IV.—DISARTICULATION OF THE METATARSUS.

Upon the supposition that the state of the foot does not allow of making the section of the bones of the metatarsus, or that the surgeon does not wish to resort to this operation, it may be possible, by means of their disarticulation, to save the tarsus, and the use of certain important muscles.

##### § I.

From surgeons being generally uninformed upon this subject, the operation in the year 1816 was looked upon as a new one. A great number of practitioners had, however, as we shall see, either recommended, or described, or even performed it! "As this amputation," says Garengeot, (*Opér.*, t. III., p. 414,) who has forcibly pointed out its advantages, "has to be made upon a considerable number of articulations which are not upon the same line with each other, it is one of a very embarrassing character. To conduct the bistoury between the bones of the metatarsus, &c., and to divide the ligaments which connect them, and to save as much skin as possible, are all the directions we can give."



Leblanc, (*Precis d'Opér.*, t. I., p. 310,) still more laconic, restricts himself to this remark: "We may, in certain cases, amputate a portion of the foot, saw through the bones of the metatarsus, or *even separate them from their articulations*, as has been stated by many practitioners." The same remark was made by Brasdor, (*Mém. de l'Acad. de Chir.*) Vigaroux (*Œuvres Chirurg.*, etc., p. 250) performed this operation on the left foot of one of his patients, in 1764, and Laroche (*Encyclopéd. Méth., part. Chir.*, t. I., p. 107) enforces the necessity of preserving in the amputations as much of the foot as possible. In England, it was performed by Turner in 1787, (*London Medical Journ.*, 1787; *Gaz. Salut.*, 1789, No. 38.) Percy says he performed it, in 1789, with great difficulty on a monk of Clairvaux; and M. Larrey (*Clin. Chir.*, t. III., p. 671; *Mém. de Chir. Milit.*) says he has been in the practice of performing it since the year 1793. We find it described also in the Thesis of M. C. Petit, in 1802. "I have," says Rossi, (*Méd. Opér.*, t. II., p. 229,) "by means of the cutting instrument, successfully extirpated the bones of the metatarsus, in a carious state, and saved the tarsus." In 1814, it was performed successfully by M. Berchu.

The following is the process given in 1803, by A. Blandin, who had employed it several times successfully: "I divide," says he, "the skin and tendons on the dorsum of the foot, by carrying the cutting edge of the bistoury from before backwards, and making it glide upon the body of the bones up to the place of their articulation, in such manner as to preserve a small flap, (dorsal;) I then divide all the ligaments; and afterwards, with the point of the instrument which I carry through the joint to below the tarsus, I complete the division of the bridges, and amputate the entire part with a single transverse section, preserving, as on the dorsum, a small portion of the tissues of the sole of the foot, in order to form a second flap."

M. Plantade in his Thesis, 1805, held nearly the same language. A child of four years of age, upon whom the operation was performed by Yatman, (*Bibliot. Méd.*, t. LIX., p. 261,) got well in fifteen days. Nevertheless, M. Villermé and M. Lisfranc, who made this operation the subject of a special investigation, presented to the Institute in 1815, supposed that they were to some extent the authors of it. We are at least indebted to them for having given a careful description of the process to be adopted.

## § II.—Anatomy.

The three cuneiform bones united, present in front a kind of *mortice* slightly flaring which is exactly filled up by the posterior extremity of the second metatarsal bone, and the inner wall of which cavity has a length of about four lines, with an inch in height, while its outer wall has hardly two lines in extent from before backwards.

The articulation of the *first metatarsal bone*, which is consequently found two or three lines farther forward than that of the third, is less wedged than any of the others; its surfaces represent a double oblique plane, from within outwards, in the direction of a line which would strike on the middle of the metatarsal bone of the little toe, and then

from above downwards, and from before backwards. That of the *metatarsal bone of the middle toe*, in other respects situated transversely like that of the second, is found to be two lines in front of the bottom of the mortice already described above. The interline of the fifth is oblique from without inwards, as if to strike upon the middle of the first metatarsal bone; while the fourth is almost horizontal on its outer part, and inclines in front like the preceding at the moment when it is about to become continuous with the third, being situated usually at one or two lines behind the latter.

As the *second metatarsal bone* is enclosed as it were between the bones of the tarsus, it is rare that the third cuneiform bone is not, in its turn, enclosed in another kind of mortice, of one or two lines in depth, formed by the third metatarsal bone in front, together with the second and fourth upon its sides. If the first did not exist, the second should equally be wanting. In fact, if the third cuneiform bone was upon the same plane as the second, the articulation would be perfectly regular from the outer border of the foot to the first; but this bone often makes so considerable a projection, that it reaches nearly to a line with the first cuneo-metatarsal articulation. In such cases, the disarticulation of the two mortices is attended in both with nearly the same difficulty. Other anomalies also are sometimes met with. I have, for example, seen the antero-internal articulating surface of the cuboid bone extend half a line, or even a line, beyond the metatarsal articulating surface of the third cuneiform. In another subject, the two last metatarsal bones united, resembled a sloping ridge, the crest of which, placed vertically, was sunken to a depth of three lines upon the front of the cuboid bone; and this was found to exist in both feet of the same subject. On another occasion, I found the dorsal border of the extremity of the third metatarsal bone inclined obliquely backwards, to the extent of a line and a half, upon the corresponding cuneiform bone. M. Zeigler has seen the tubercle of the fifth metatarsal bone prolonged as far as the line of the articulation of the os calcis. I have often noticed, also, in persons who are in the habit of wearing tight boots, that a tubercle, resembling an exostosis, will very frequently be formed upon the dorsum of the second cuneo-metatarsal articulation. Finally, several of these articulations may become ankylosed.

The dorsal tarso-metatarsal ligaments, the antero-posterior as well as the transverse, being nothing more than simple bandelettes or ribbons, do not require any special description. On the plantar surface, however, it is somewhat different. There these bones terminate, almost all of them, in a sort of flattened edge or crest, which, by permitting them to incline towards each other, forms the transverse concavity of the foot, leaving between them small triangular spaces, which are filled by fibrous bundles. One of these fasciæ, viz. that which unites the outer surface of the anterior projection of the first cuneiform bone to the inner surface of the second metatarsal, merits every attention from the operator. It is especially remarkable by its thickness in a vertical direction, bounded by that of the articulation itself; as to the others, there is nothing of any special importance to remark concerning them.

Viewed in its ensemble, the tarso-metatarsal articulation represents a line slightly convex forwards, and the extremities of which correspond

nearly to the middle of the space which lies between the malleoli and the roots of the toes. Upon the outside, it is designated by the posterior extremity of the tubercle of the last metatarsal bone, observable under the skin. On the inner side it is also very easy of recognition, by observing that the first cuneiform and the first metatarsal bone, each present a prominence under the integuments near the plantar surface of the foot, which gives the articulation the appearance of being depressed. A line, drawn transversely from the outer extremity of the articulation to the inner border of the tarsus, falls a little in front of the scaphoid bone, and is distant about three-quarters of an inch from the tarso-metatarsal articulation on the inside. It cannot, therefore, be a matter of much difficulty, before proceeding to the operation, to identify both its direction and position. As it is to the lower or plantar tubercle of the posterior extremity of the first metatarsal bone that the tendon of the peroneus longus muscle is attached, and that this tendon usually contracts some adhesions as it passes under the third cuneiform bone, the mere disarticulation of the metatarsal bones does not necessarily destroy its action. It is the same with the peroneus brevis and peroneus tertius muscles, which are inserted in part, at least, upon the dorsal surface of the cuboid bone, and also with the tibialis anticus and tibialis posticus muscles, whose continuity, in like manner, is not destroyed by the disarticulation of the first bone of the metatarsus.

The disarticulation of the metatarsus is, without doubt, one of the most difficult operations than we can encounter. To perform it, most authors who have described it recommend that we should employ at the same time both the bistoury and the saw.

[PRACTICAL OBSERVATIONS ON AMPUTATIONS AT THE TARSO-METATARSAL ARTICULATIONS.—By Dr. Charles Edwards, Cheltenham.

Supposing the single or double flap formation at the option of the operator, in order, first, to get the line of cicatrix near the upper margin of the stump, and secondly, to avoid the painful and unnecessary dissecting-up of an anterior flap, I think it best to make but one flap—a plantar one.

To reach the line of articulations, and have a precisely adapted flap, ink the following lines:—First, a line near the roots of the toes, *a, b, g*, close by their commissures. Precisely parallel with this dotted guidance-line draw another arched line, commencing at the projection of the fifth metatarsal bone, or an eighth of an inch below it. This parallelism will prove an equal, if not superior guide to the articulation between the first metatarsal and internal cuneiform than any conjectural measurement from the projection of the navicular, which itself, in certain diseased states, is not easily felt. This arched line will be the course for the dorsal incision; the structures *retracted*, not *reflected*, will correspond to the joints.

Unite across the plantar surface the cornua of this irregular arc by a right line: it now only remains to mark its periphery, which will be determined by inking, if thought necessary, another arched line on the plantar surface, precisely bounding the roots of the toes, *l, m, n* (as *a, b, g*, on the dorsal surface).





*a, b, g*, commissure guidance line  
*C, D, E*, line of dorsal incision.

*l, m, n*, periphery of plantar flap.  
*c, g*, base line of ditto.

Having thus accurately defined the measurements, I would conclude with a few observations on the plantar flap, the dorsal incision, and finally the management of the second metatarsal bone.

As to the plantar flap, commence with a strong scalpel at, or slightly beyond, either extremity of base-line, and deeply groove out the whole circuit of the flap from without, carrying your incision round by the plantar arched line till it meet correspondingly the other extremity of base-line. Finish this flap, not with a scalpel or bistoury, but with a small, straight-edged amputating knife, one stroke of which will smoothly reach the base by reason of its greater breadth. Thus, in addition to a more perfect outline of the flap than can be obtained *from within* after the disarticulation, by cutting *from without* no tendons are left projecting to be clipped. Some authors say, "Keep close to the metatarsal bones." If, however, you have, and leave too much muscle in this plantar flap, you will incur difficulty in bending it up over the stump, and much pressure and many sutures to keep it there: I speak to operators on the *living* body.

Secondly, as to the dorsal incision, see that the assistant who has charge of the arterial pressure presses perpendicularly to the surface, and does not disturb the parallelism, while the dorsal incision is being made, by unequal or, indeed, any tegumentary retraction.

Finally, with respect to the disarticulation, when from disease you cannot save the head of the first metatarsal bone, or leave behind that of the second with impunity, I have in an instant disarticulated the latter, without previously removing any projection of the first cuneiform, by the following method:—The plantar flap being formed as directed, and the union of its base extremity and the corner of dorsal incision clearly made, disarticulate the first metatarsal, then press the metatarsus, not downwards, but rather directly outwards (this manipulation admits of easier demonstration than description). The point of a scalpel applied laterally, by a person knowing where to expect the articulation, will most readily penetrate it, and so the chief difficulty of the whole operation will be readily overcome by any dexterous hand.—*Lancet*, April 30, 1853, p. 405. G. C. B.]

§ III.—*Partial Disarticulation.*

Instead of removing the whole metatarsus, it may be sometimes practicable to take away only a portion of it. Briot (*Progrès de la Chir. Milit.*, p. 187) states that a patient, in whom he removed the two last bones of the metatarsus and the corresponding toes, was afterwards enabled to walk without difficulty. The same was the case in the patient operated upon by Béclard, (*Arch. Gén. de Méd.*, t. V., p. 182.) M. Bouehet (Montfaleon *Etat Actuel de la Chir.*, p. 44) states that he has, in the same manner, removed the third, fourth, and fifth metatarsal bones. In one case of Béclard, (*Arch. Gén. de Méd.*, t. V., p. 186,) he took away only the two first. M. Ouvrard (*Mélanges de Méd. et de Chir.*, p. 221) succeeded also in removing the third and fourth, and in preserving the fifth. M. Macfarlane (*Gaz. Méd. de Paris*, 1836, p. 515) has removed the second metatarsal bone only, together with its toe; but in such cases disarticulation should be interdicted.

The disarticulation of the metatarsus endangers inflammation of all the joints of the foot, is tedious and difficult of execution, and possesses no advantage over the section of the bones a little in front. When the metatarsal bone is laid open upon its dorsal surface, by means of a very long ovalar incision, it should be divided by the rowel saw, if the disease has extended very far, or, in the contrary case, by Liston's pliers. Thus modified, the operation becomes rapid and simple.

§ IV.—*Disarticulation in mass.*

A. *Process of Hey.*—In a young girl of eighteen years of age, operated upon in 1799, by Hey, he made a transverse incision at the distance of about half an inch in front of the articulations; then made another upon each side, from the corresponding extremity of the first to the root of the first and fifth toes. In order afterwards to form a flap, he detached all the soft parts from the plantar portion of the foot, and turned them back. After having disarticulated the four last metatarsal bones, he decided also upon removing the projection of the first cuneiform bone, which he did by means of the saw. The patient recovered perfectly.

B. *This process* is as good as any other, except that the lateral incisions and the precaution of forming the plantar flap, before disarticulating the bones, render the operation both longer and more difficult. Hey, in remarking that the four last metatarsal bones are found nearly upon a line, wishes to convey, as I understand him, that their respective posterior articulating surfaces extend but very little beyond each other, and not as they have made him say, that they form a perfectly transverse line. As to the section of the first cuneiform bone, it does not, in my opinion, deserve the censure which our surgeons have undertaken to cast upon it. Béclard (*Bull. de la Fac. de Méd.*, t. VI., p. 319; *Archiv. Gén.*, t. V., p. 194) and M. Seoutetten (*Arch. Gén. de Méd.*, t. XIII., p. 54) have performed this operation, and have had no reason to be dissatisfied with it.

C. *Process of Turner.*—Turner, who recommends saving as much of

the skin as possible, after having divided the soft parts, made the section of the bones upon their dorsal surface. M. J. Cloquet (*Dict. de Méd.*, t. II., p. 171) also thinks it better after having formed an upper flap, that we should make a transverse section of the bones rather than stop to disarticulate them. M. Blandin attributes this process to Bécclard, who has not, that I am aware of, published it anywhere. It is probable that M. Blandin confounds the section of the first cuneiform bone, which in fact was performed by Bécclard, with the proposition of M. Cloquet. I do not know that any other person than Murat, (*Journ. Hebdom.*, t. III., p. 44,) who once performed it successfully at the Bicêtre, in 1828, has ever employed it; but I cannot perceive how it can be more dangerous than simple disarticulation; *à priori*, in fact, we would be led to believe that it would less frequently be followed by serious accidents. The laceration, instead of the incision of the ligamentous, or fibrous tissues, which appears formidable to some persons cannot be as injurious as the tractions which we are compelled to make upon the articulations of the tarsus, when we undertake to separate the metatarsus from it with the knife. The surfaces of the sawed bones are fully as favorable to the immediate union of the wound as would be the cartilaginous surfaces.

The recommendation of M. J. Cloquet, which appears to have been only intended by him for those surgeons who had not had it in their power to make themselves sufficiently familiar with the tarso-metatarsal disarticulation, has been adopted by M. Mayor, who takes upon himself the responsibility of laying it down as a law, justifying in every particular, by his own practice, what I have said above, and what I had already stated in this work, in the edition of 1832.

D. *Process of M. Lisfranc.*—I do not give the process of M. Villemé, because that physician himself avows that that of M. Lisfranc is to be preferred.

E. I shall, however, now give a description of the process which I employ, after my own trials with it, that all the responsibility of it may rest with the author.

I. *First Stage.*—We make use of a narrow strong knife for all the stages of the operation. A good bistoury, however, would answer until we have nothing farther to do than to make the palmar flap. If the surgeon is ambidexter, he commences on the outer border of the foot, holding the knife in the right hand, for the right limb, and in the left hand for the left limb; otherwise, we begin in the last case upon the inner border of the metatarsus. An assistant seizes hold of the lower part of the leg, compresses the posterior tibial artery behind the internal malleolus and the anterior tibial upon the instep, at the same time that he draws back the skin on this last-mentioned part. The operator first identifies the extremities of the articular line, and with one hand embraces the point of the foot upon its dorsal surface, in order to act more freely upon the entire metatarsus. With a knife in the other hand, he makes a semilunar incision, with its convexity forward, and at six to ten lines in front of the articulations. The instrument is reapplied to the first incision, in order to divide, on a line with the retracted skin, the extensor tendons and other soft parts which may remain adherent to the bones, and in such manner that this second incision may corres-



pond with the line of the articulation. In arriving at the border of the foot, it is important not to descend too low towards the plantar surface, for in terminating the operation we should not then be enabled to give all the breadth required for the base of the principal flap.

II. *Second Stage.*—If the articulation has not been laid open with the same cut which has divided the tendons, we enter it by carrying the point of the knife behind the tubercle of the fifth metatarsal bone, in the direction of a line which, extending obliquely forward, would fall first upon the head, then on the middle portion, and then on the posterior extremity of the first metatarsal bone, making the incision almost transversely in arriving at the articulation of the fourth metatarsal bone, and inclining it again in front at the moment of entering the articulation of the third, which latter is separated by immediately directing the instrument transversely.

The second bone of the metatarsus prevents us usually from going any farther in this direction. We then withdraw the knife, in order to apply it, with the point directed upwards, to the inner border of the foot, so as to divide from within outwards, and from behind forwards, the articulation of the first metatarsal bone. The surgeon then immediately places it in a perpendicular position with its point downwards, and turns its edge backwards, upon arriving at the second metatarsal bone or upon the inner side of the cunean mortice; then plunges it towards the plantar surface of the foot, and as far as the line of the apex of the articulating surfaces, then pressing against its handle as if to give it a vibratory movement, from behind forwards, and then from before backwards, he divides the great ligament, which is *the key of the articulation*. Withdrawing it again, in order to come upon the posterior articulating surface of the second metatarsal bone, he places its point horizontally transverse upon the superficial surface of this bone. As the joint is never more than three lines behind, it is easy to open into it by cutting successively at distances of half a line at a time from the articulation of the middle metatarsal bone which is already laid bare, until we shall have reached that of the second. All the articulating surfaces are now laid open, and the point of the knife being inserted between them, readily divides all the remaining ligaments.

III. *Third Stage.*—There now remains nothing more to do than to form the plantar flap by grazing the plantar surface of the bones [with the edge of the knife, until it reaches] nearly as far as the metatarsophalangeal articulations. This flap should be an inch longer on the inner than it is on the outer side; also it should be made to terminate in a bevelled, (shelving,) and not a square-shaped edge, and in order that it may adapt itself better to the semicircular curvature of the dorsal border of the stump, it should be slightly rounded upon its digital extremity, and not be made wholly transverse. If we prefer having its inner fully as thick as its outer border, we must take care while cutting the flap, to hold the handle of the instrument in a much more elevated position than its point; and in order that the phalangeal head of the metatarsal bones, that of the first especially, may not arrest the blade of the instrument, it is important to give to its cutting edge, and that at an early period, a strong inclination towards the skin.

IV. *Dressing.*—The arteries divided and requiring torsion or the lig-

ature are the internal and external plantar arteries, the *dorsalis pedis*, and some other secondary branches of little importance. The principal flap being raised up against the articular surface, ought to cover it exactly and have its border adjusted back against the little flap which should have been preserved upon the dorsal surface. If upon this last-mentioned surface the integuments should have been divided upon a line with the articulation, the bones of the tarsus would not fail to become denuded immediately after. It is easy then to conceive that it would be a difficult thing to cover them conveniently with the lower flap. As the tendons retract less than the skin, should they have been divided also at the first incision, their extremities might obtrude between the lips of the wound and considerably interfere with its union by first intention. It is better, therefore, to excise them with the scissors. The strips of adhesive plaster, in order that they may more firmly sustain the coaptation of the parts, ought to be made to reach from the posterior internal and lower surface of the heel as far as to the stump, then extending longitudinally over the dorsal surface of the foot, they should be made to pass round the lower part of the leg or at least be carried to the neighborhood of the malleoli.

The patient having been carried to his bed, should be placed in such manner as that the leg and foot upon which the operation has just been performed, may rest on their outer side, and be in as perfect a state of relaxation as possible. Here, as after all amputations of the extremities and still more so here than under any other circumstances, methodical compression [by bandages] from the lower third of the leg nearly as far as to the vicinity of the wound, would be one of the best means we could adopt to prevent the development of synovial, venous, or any other form of inflammation.

*F. Process of M. Maingault.*—Having in the year of 1829, conceived the idea of cutting out the plantar flap at first by plunging the knife by puncture between the soft parts and the bones, with the view of then disarticulating the tarsus, in the direction from the plantar surface to the dorsum of the foot, I soon after made several trials of it upon the dead body, in the rooms of the School of Practice, and afterwards at the hospital of St. Antoine; but having found it more difficult to disjoint upon this side than upon the dorsal surface, I had entirely renounced it without having made it public, when M. Maingault, (*Bulletin de Férussac*, t. XIX., p. 60,) who had devised the same process, gave a eulogistic account of it to the Academy. His method in this case is exactly similar to the one he has proposed for the disarticulation of the metacarpus. Though practicable, it has appeared to me, all things being considered, less advantageous and more difficult than the preceding, and consequently of no utility but under circumstances where it would not be possible to adopt the latter.

#### ARTICLE V.—DISARTICULATION OF THE TARSAUS.

When the bones of the tarsus themselves are affected, the removal of the metatarsus alone is manifestly insufficient. We then take away separately or at one operation the three cuneiform bones, and the cuboid and scaphoid.

§ I.—*Partial Disarticulation.*

If the cuboid bone and the two metatarsal bones which it supports should be alone diseased, we might after the manner of Hey remove only the outer third of the foot. Unless there should be an absolute necessity, we should not amputate the whole of the tarsus. We must confine ourselves to the disarticulation or amputation of the bones that are affected. The patient mentioned by M. Villermé, (*Journ. de Méd. cont.*, 1815, p. 32,) and who died at the expiration of six weeks, had had the three cuneiform bones and the corresponding portion of the metatarsus, removed. M. Ruyer, (*Révue Méd.*, 1832, t. IV., p. 187,) in removing the great toe and the metatarsal bone which supports it, and also the two first cuneiform bones, was enabled to save the four last bones of the metatarsus. The cuboid bone and the two metatarsal bones which are articulated to it in front, have, together with the fourth and fifth toes, been removed with a no less fortunate result, first by Bécлар, (*Arch. Gén. de Méd.*, t. V., p. 190,) then by M. McFarlane, (*Gaz. Méd.*, 1836, p. 516,) which operation has also been successfully performed in Holland by M. Kerst. These operations, moreover, are in their character extemporaneous, and if I may use the term, *magistral*, whose manipulating processes cannot be laid down in advance. It is necessary that the surgeon should invent them in some sort, every time he is obliged to perform them. The incisions of M. Kerst have some analogy to those which I recommend for amputation of the first metatarsal bone; if somewhat modified they would have answered equally well in the process of M. Ruyer, (*See exsection of the foot.*)

[Where one of the tarsal bones only is carious or degenerated, it may, Mr. Syme thinks, (*Cormack's Lond. & Edin. Monthly Journ.*, &c. February, 1843, p. 95,) be taken away at the same time with its corresponding diseased metatarsal bone. Thus the first metatarsal with the internal cuneiform bone, and the os cuboides with the two metatarsal bones articulated to it, &c. T.]

§ II.—*Disarticulation in mass.*

Amputation between the os calcis and astragalus on the one part, and the scaphoid and cuboid bones on the other, is like that of the metatarsus, an operation, the origin of which can be traced to the ancient writers, and would have belonged entirely to France, had not Fabricius of Hilden clearly alluded to it, and several persons actually described or performed it before the time of Chopart, and which operation since its discovery has, in reality, only been brought to perfection by our own countrymen. It is therefore somewhat strange that up to the present time the honor of this operation should have been given to Chopart, who never spoke of it until in the year 1787. Hequet of Abbeville, however, in the year 1746, showed to Winslow (*Acad. des Sc. Hist.*, p. 58, 1746, in 12mo.) a foot which had been separated in front of the astragalus and os calcis. Vigaroux, (*Œuvres Chir.*, etc., p. 250,) however, in the year 1764, declares that he had amputated the foot at the tarsus for a gangrenc. Lécat, (*Mercure de France*, Dec., 1752, 2c partie. Ma-



jaut, *Prix de l'Acad. de Chir.*, t. III., p. 232.) moreover, had had recourse to it and formally recommended it in 1752. But A. Petit (*Méd. du Cœur*, p. 365,) who had performed it twice before the year 1799, did not make known his observations until after Chopart.

A. *Anatomy*.—The articulation separated by Lécat, is infinitely less complicated and less difficult to disunite than the preceding. The four osseous surfaces which compose it, possessing some degree of mobility, are far from being as closely wedged together as those of the tarso-metatarsal articulation. The rounded head of the astragalus is maintained in the cavity of the scaphoid bone, by means only of loose fibro-cellular bands. On its outside and on its dorsal surface the same arrangement exists for the os calcis and the cuboid bone. The strongest and most important ligament of this joint is that which passes deep down from the os calcis to the fibular extremity of the scaphoid, and which may also be denominated the *key of the articulation*. The articular line in this part is divided into two very distinct portions. Its inner or astragalean half represents a half-moon with a very regular anterior convexity. Its outer or calcanean half on the contrary represents an oblique plane from within outwards and from behind forwards; so that in blending with the other it forms a sinus of considerable depth, which seems to be continuous with the dorsal cavity of the os calcis, and where we may be easily misled at the time of the operation, if we do not accurately call to mind the disposition of the parts.

Like that of the metatarsus, the articulation of the bones of the tarsus with each other, is exceedingly concave and unequal upon its plantar surface, where the scaphoid and cuboid bones form a projection which must not be forgotten when we are about to separate the soft parts from them. Its inner side is marked by a slight depression which is bounded behind by the tuberosity of the os calcis, and in front by the corresponding tubercle of the scaphoid, a tubercle which we no longer search for at the present day, in order to strike between the astragalus and the os naviculare. On the outside, the articulation of the tarsus is found at eight or ten lines from the posterior extremity of the fifth metatarsal bone, near the middle of the space which separates this tubercle from the small crest, on the outer surface of the os calcis, to which is attached in front the tendon of the peroneus longus. Upon the dorsum of the foot, the articulation under consideration is indicated by the slightly depressed line which is felt by the finger in front of the head of the astragalus.

Anomalies may form exceptions to these rules. The tubercle of the scaphoid is sometimes scarcely perceptible. In other cases the tendon of the tibialis posticus becomes the seat of a sesamoid bone which in great part effaces the articular depression. M. Plichon (*Thèse* No. 261, Paris, 1828) has remarked, that the calcaneo-scaphoidean ligament, or that species of *articular key* mentioned above, may be transformed into an epiphyseal cartilage, and become completely osseous, even in quite young persons. He has several times met with this peculiarity, and while sustaining his thesis exhibited a specimen of it before the Professors of the Faculty. We can readily conceive the difficulties the surgeon would encounter in such cases in terminating his operation. It was this without doubt which had produced the species of ankylosis

which M. A. Cooper was compelled to break before finishing a partial amputation of the foot; and the same as that spoken of by M. Fisher, (*Nouv. Bibl. Méd.*, 1829, t. II., p. 432,) and which would have yielded only to the saw, if it had been necessary to amputate in this case during life. M. Plichon also remarks, and with reason, that the head of the astragalus extends much farther in certain cases than in others beyond the line of the anterior surface of the os calcis, and that the calcaneo-cuboidal articulation is then less oblique in front.

**B. Operative Process.**—The manner of disarticulating the scaphoid and cuboid bones has necessarily varied only in its less important details. Chopart, who did not have the advantage of the anatomical knowledge which we possess to-day, spoke of it as an operation of considerable difficulty. It is a fact that in 1799 Pelletan was nearly three-quarters of an hour in performing the operation; though he had before him the foot of an articulated skeleton; but since M. Richerand and Bichat demonstrated that we may always feel under the skin the projection of the inner extremity of the scaphoid bone, the difficulties which accompany the operation have become so much lessened, that it is at the present time one of the most easy in surgery.

**I. Process of Chopart.**—The limb and the surgeon should be placed as in the preceding disarticulation. A transverse incision is first made at two inches in front of the malleoli. Upon the extremities of this incision the operator makes two others of slight extent; dissects up the trapezoidal or quadrilateral flap which they form, and turns it back upon the leg; opens the articulation from the inner to the outer border of the foot; divides the calcaneo-scaphoidean ligament in passing through the joint; arrives upon the plantar surface of the scaphoid and cuboid bones, and finishes with the incision for the lower flap, which he prolongs to near the extremities of the metatarsal bones.

[*Chopart's operation*, notwithstanding it had been so long in use on the continent, was never, as Mr. Syme thinks, (Cormack's *Lond. and Ed. Month. J.*, &c., Feb., 1843, p. 95,) performed at Edinburgh until by him in 1829, (*Quarterly Report of the Edinburgh Surgical Hospital, Edinburgh Surgical and Medical Journal*, 1842;) since which he has practised it repeatedly with the most satisfactory results, and without any inconvenience from the danger apprehended that the predominant power of the tendo Achillis would cause a pes equinus of the stump. Mr. Syme found that the cut extremities of the tendons on the fore part of the joint speedily acquired new attachments which enabled them to counteract this antagonism. This opinion we shall see has not been verified by the experience of other surgeons. T.]

**II. Process of M. Richerand.**—M. Walther gives a little more, (Rust's *Handb. der Chir.*, t. I., p. 674,) and M. Graefe (*Ibid.*) a little less length to the dorsal flap; in other respects their description of the partial amputation of the foot is the same as that of Chopart. The modification proposed by Bichat and M. Richerand has been long since adopted in France, that is to say, instead of circumscribing a dorsal flap by three incisions, we confine ourselves to one incision which is semilunar with its convexity forward, and made at a few lines only in front of the articulation. Klein and M. Rust (*Ibid.*) making this flap still shorter than that of Chopart, propose to go at once into the articulation.

M. Rust recommends that a long incision should be made on each border of the foot to trace out beforehand the form of the plantar flap.

III. *Process of M. Maingault.*—M. Maingault recommends that we should in the same way as for the metatarsus and metacarpus, proceed from the plantar to the dorsal surface in disarticulating the bones of the tarsus, and considers that this new process should be adopted at least in certain cases. On that point I coincide with him entirely.

IV. It appears to me superfluous to discuss the relative importance of these various modifications of the general operative process; all of them may find their application in practice. If there were no soft parts that could be preserved except upon the dorsal surface, for example, it is clear that we must take them from here, and that we should on the contrary take them wholly from the plantar region, if the integuments were degenerated upon the dorsum of the foot nearly up to the leg. If there were neither sound tissues enough above nor below, to enable us to obtain a flap to cover the wound, I cannot see why we might not decide upon cutting two of them of equal extent. But when the sole of the foot is not too much disorganized, the course recommended by Bichat is unquestionably the most rational and the best. A semi-circular incision from one malleolus to the other, as advised by M. Bougard, (*Annales Cliniques de Montpellier*, 2e série, t. IV., p. 68, 1829,) would have no other advantage than to give a little greater length to the wound.

V. *Process adopted by the Author.*—*a. First Stage.*—Therefore, while the assistant who compresses the arteries draws back the integuments, the surgeon with one hand embraces the back of the foot, and with a small knife in the other makes an incision slightly convex at an inch in front of the articular line, and carries the same from the inner to the outer border of the foot for either limb, if he is ambidexter, or from the outer to the inner border for the left foot, when he can use only his right hand with confidence. After having caused the tissues to be drawn back, he reapplies the instrument to the wound and divides in the same direction and near to the retracted skin, the tendons and other tissues which still cover the osseous surfaces, and may almost always enter the articulation by this second incision.

*b. Second Stage.*—If not, after again assuring himself of the position occupied by the scaphoidal tubercle, the surgeon divides upon the whole extent of the dorsal surface, and from within outwards, the fibrous bands which unite the scaphoid bone to the astragalus without endeavoring to penetrate into the joint; seeing that the head of the last-mentioned bone, (the astragalus,) encased and hidden in the cavity, and as it were overlapped by the thin border of the other, (the scaphoid,) would form an obstacle to his doing so; he therefore describes a semi-lunar incision, being particularly on his guard not to prolong the outer branch of it too far backwards, but taking care on the contrary in order to disarticulate the cuboidal bone, to incline the cutting edge of his knife, first transversely, and then a little forward, and as soon as the articulating surfaces are separated wide enough apart to admit of it, to make the section of the thick fibrous bundle which unites the os calcis to the scaphoid, in order to reach the deep-seated surface of the articulation.



c. *Third Stage*.—The operator then directs the cutting edge of his instrument forwards; grazes the under surface of the tarsus, and cuts the plantar flap; depressing the wrist, if it is the left tarsus, and elevating his wrist on the contrary if it is the right; [See first stage above. T.] in order that this flap may not be thinner on the inner than the outer side, and prolongs it a little more on the inner than on the outer border, because of the astragalus which rises much higher towards the leg than the os calcis does. As the vertical extent of osseous surfaces exposed is greater than after the metatarsal disarticulation, the flap should be prolonged forwards almost as far as for this last, although it was commenced nearly two inches farther back.

d. M. Sédillot in order to give greater exactness to this process, and following out what I have said of it above, forms his inner flap precisely in the direction of the great diameter of the astragalo calcanean surfaces. We have thus a narrow wound, giving a linear cicatrix, easy to unite and to be kept united, allowing a free discharge to the pus, and requiring but little integuments to cover it. Every person is aware how difficult it is to cut out a plantar flap of sufficient length in the disarticulation of the metatarsus and tarsus. M. Sédillot (*Communiqué par l'Auteur*) has pointed out an expedient which removes the embarrassment. All that is required is, that while grazing the plantar surface of the metatarsal bones, the cutting edge of the instrument should be made to fall upon the sesamoid bones of the great toe. The knife which is constantly found to catch at this point, must be made to pass around it, when by incising through the integuments at two to three lines in front of it we obtain a suitable flap.

e. *Dressing*.—To tie the arteries in proportion as they are divided, as Chopart advises, is a useless precaution. The only arteries after the operation that demand attention, are the dorsalis pedis and the two plantars. The dorsal integuments are now immediately brought in front, and the plantar flap is raised up, and kept upon the cartilaginous surfaces by means of long strips of adhesive plaster, and a roller bandage methodically applied.

c. *Consequences*.—The cure, after this operation, may possibly be effected in fifteen or even ten days. It is liable to all the accidents of other amputations. Inflammation and suppuration in the neighboring articulations, or of the tibia and os calcis, would be a very serious accident. This inflammation proved fatal in a patient of M. Lallemand, (*Ephémér. de Montpellier*, Journal Analyt., 1829, p. 413,) by extending to the leg by means of the tendinous grooves. A young man also operated upon by M. Simonin, (*Décade Chir.*, 1838, p. 1,) was seized with delirium and died. But the reversion of the heel is the inconvenience which has been most usually complained of. This is a real difficulty, and has been established by M. Larrey. It occurred in a patient I saw in the Hospital of St. Louis in 1820, which case is referred to also by M. Mirault, (*Arch. Gén. de Méd.*, t. V., p. 195.) A second patient, also amputated at the hospital of Saint Louis, presented another example of it in 1836. M. Fleury (*Ephémér. Méd. de Montp.*, t. II.) has also seen a case. M. Blandin, therefore, (*Gaz. Méd. de Paris*, 1838,) who questions its reality, is mistaken. Means have even been proposed both

to prevent and remedy it. M. Berchu, for example, supposes that it might be prevented by keeping the leg flexed after the operation.

In adopting this opinion, M. Lallemand recommends the limb to be placed upon its outer side. M. Mirault thinks we should do better by applying a roller bandage to the whole of the leg; but there are no grounds to suppose that such expedients would have the least efficacy. In the patients in whom I have noticed the reversion of the heel, it was evidently owing to the impossibility of uniting the wound by first intention, and because the border of the plantar flap had not been attached to the dorsal border of the wound. The best preventive means, therefore, consists in doing everything in our power to accomplish agglutination, or at least partial union of the two lips of the wound.

It has been, moreover, supposed that the section of the tendo Achillis would overcome this retraction. M. Champion formally proposed this, in supporting his thesis in January, 1815, and M. Villermé believed that the idea originated with him; but Antoine Petit had done better, (*Disc. sur les Mal. Obs. à Lyon*, p. 364;) having had recourse to this auxiliary operation in one of his two patients, he obtained complete success. With this claim we may even say that A. Petit is the inventor of tenotomy in France. When, however, the flaps have been well constructed and are well supported, the retraction of the tendo Achillis, after amputation of the tarsus, occurs only as an exception. Neither M. McFarlane nor Dupuytren have seen it. It occurred in none of the five cases that I operated upon, and M. Blandin says he has met with it but once out of the eleven of these amputations that he has performed.

[*A reversion of the os calcis backward, following partial amputation of the foot*, was completely cured by M. Hippolyte Larrey, by a division of the tendo-Achillis, (*Séance de l'Acad. de Méd.*, Nov. 9, 1841; vid. *Archiv. Gén. de Méd.*, 3e sér., Dec., 1841, p. 515.) T.]

#### ARTICLE VI.—COMPARATIVE VALUE OF THE TWO MODES OF PARTIAL DISARTICULATION OF THE FOOT.

Since surgeons have demonstrated that it is quite as practicable to disarticulate the metatarsus as it is the whole anterior range of the bones of the tarsus, it has been asked which of these two operations should have the preference. A question like this ought not to have been propounded. These operations are not calculated to replace each other, and each has its special applications. When disarticulation of the metatarsus suffices, amputation after the manner of Chopart becomes useless; in the same way as when the disarticulation of the scaphoid and cuboid bones admits of our removing all the disease, there is no need of amputating the leg. Some persons, however, still seem to be of the opinion that, even where the disease does not extend beyond the metatarsus, it is better to amputate like Chopart. To support this proposition, they argue upon the difficulties of the tarso-metatarsal disarticulation, the few advantages that can result from it, the severe pain it must produce, and the greater dangers that must ensue from it. The synovial membrane, which lines the anterior cunean and cuboidal articulating surfaces, being continuous with that of the cuneo-scaphoidal

articulations, is, says M. Blandin, (*Nouv. Biblioth. Méd.*, 1828, t. I., p. 212,) the reason why inflammation, when once developed here, is readily propagated to all these aufractuous surfaces, and terminates in their disorganization.

To these reasonings it may be answered : 1, That with exact anatomical knowledge, we may succeed in performing the operation in question without any great difficulty ; that a single cut of the saw, moreover, would speedily relieve the embarrassment, if any should occur from the projection of the first cuneiform, or of the second metatarsal bone ; 2, that the section of the ligaments and the separation of all the bones, may be made with such rapidity as to cause no great severity of pain, if we take the trouble of dividing instead of tearing the fibrous tissues ; 3, that the inconveniences which are spoken of, are, up to the present time, based upon little else than conjectures, and that this operation has not been performed sufficiently often to enable us to draw an exact parallel between it and that of Chopart ; 4, as to the disposition of the cartilaginous surfaces, it is such in fact that the *surface*, not the *synovial membrane*, of the second cuneiform bone, is quite often not always, where it unites with the great cuneiform bone, continuous with that of the anterior surface of the scaphoid ; but it is quite true that the synovial head of the astragalus, and the anterior surface of the os calcis which is also sometimes continuous between these two bones as far as the cartilaginous pulley of the last, has less extent than that of which we have just been speaking ?

The new operation gives a length to the foot which easily admits of standing and walking and the movements of flexion and extension. It causes but a trifling deformity, which may be easily concealed by giving a slight modification to the shoes. In the method of Lécat it has often happened, as I have said above, that the heel is turned back to such extent as not to allow of the patient walking with a simple buskin. This inconvenience, it is true, is quite rare ; but it is possible, however, and in itself is a sufficiently serious thing. It is not owing to the extensor tendons of the foot having been divided. It is known that these tendons, after their section, scarcely retract, and that they contract firm adhesions to the cicatrix ; but the posterior branch of the lever represented by the foot, being left in some sort by itself, the tendo Achillis thereby acquires a predominance over it which it was far from having before.

If this operation presents at the present time numerous examples of success, it has also alike had its reverses ; and if the other has sometimes caused death, it has also been performed with perfect success by Percy, Hey, Blandin, Berchu, Béclard, Janson, Miquel, Lisfranc, Kluy-skens, Zinc, Scoutetten, Guthrie, Bedor, (*Rév. Méd.*, 1823, t. III., p. 379,) Jöbert, (*Journ. Hebd.*, 1828, t. II., p. 336,) and Ouvrard, (*Mél. de Méd. et de Chir.*, t. I., p. 138.) The safety and interest of patients therefore require that both these operations should be retained in practice, and neither of them substituted for the other.

If the surface of the *os calcis* and of the *astragalus* should be altered, and the disease has extended only to some lines in depth, ought we in that case to renounce the partial amputation of the foot ? M. Roux, in one of his cases, having struck behind the joint which he wished to



open, immediately decided upon removing with a saw the projecting portion of the two first bones of the tarsus. Serious accidents followed, and the patient ultimately died; the tibio-tarsal synovial membrane had unfortunately been opened during the operation. I would not follow the example of M. Roux where the articulation is healthy. But if the cartilaginous surface of the astragalus and os calcis were affected, it is my opinion that this modification ought to be adopted, and that we would thereby avoid the necessity of sacrificing the patient's leg; it being understood that we should take every necessary precaution to avoid the accident of which I have spoken. This advice, and which I gave in 1832, has been attended to. M. Mayor (*Journ. des Conn. Méd.-Chir.*, t. I., p. 138) followed it in four cases, and it does not appear that anything serious ensued. We have therefore in this another modification of partial amputation of the foot.

#### ARTICLE VII.—DISARTICULATION OF THE FOOT.

##### § I.—*The whole Foot.*

From the rule laid down, in other respects so just, that we should amputate the least quantity of parts possible, surgeons have repeatedly asked the question, whether if disarticulation of the foot would carry out our intention, it ought not to be preferred to amputation of the leg; and whether after this disarticulation it would not be possible for the patient to walk with a particular kind of shoe, or a sort of buskin which would conceal his deformity? It was once successfully performed by Sedillier, and Brasdor (*Mém. de l'Acad. Royale de Chir.*, t. V., 1819,) asserts that the cicatrix which was completed in a short time, never re-opened during the twelve years that the patient survived. Hippocrates, Fabricius of Hilden, and Scultetus, appear also to have alluded to it but in a very vague manner. Since then, other persons have again proposed it, but without being enabled however to effect its adoption. Rossi (*Med. Oper.*, t. II., p. 229) also states that he had performed it with ease.

The projection made by the malleoli below the tibia, renders the cicatrix, it is asserted, incapable of sustaining the weight of the body after the cure. The deficiency also of soft parts in this place, and the numerous tendons that surround the articulation, diminishing the prospect of immediate reunion, gave room to apprehend accidents of the most serious nature. But are not most of these difficulties and dangers imaginary? What is certain is, as Brasdor had already remarked, that the projecting points of the malleoli soon become smoothed, and the whole extremity of the limb rounded, and that it is in our power to preserve a sufficient quantity of integument to cover a great portion of the wound. Theoretic objections, and one or even two facts, are not sufficient to decide a question of this kind definitely, and I am of opinion that if favorable circumstances presented, it would be allowable on this subject to make additional trials; so much the more so, since, according to M. Couprie, (*Thèse No. 110, Paris, 1825,*) there was an old soldier, familiarly known for a long time, who had undergone in the campaign of Russia the amputation in question, and who walked by means of a bus-

kin. This buskin, designed by the patient, was constructed upon the same principle as that of M. Mille, of which we shall speak shortly. M. Lenoir, (*Thèse citée*, p. 30,) who dissected the limb in 1834, says that the amputation in this man's foot had not been regular, and that one of the malleoli was wanting; which adds a still greater interest to the result.

A. The *operation* in itself moreover, would offer no difficulty. Two semilunar incisions, one over the instep, the other above the heel, at twelve to fifteen lines in front of and behind the articulation, and uniting so as to form another semilunar incision on each side, at about an inch below the malleoli, would constitute the first stage. After having drawn back the skin, we should divide as near as possible to the articulation, the extensor tendons of the toes and of the peronci muscles, that of the tibialis anticus, and those of the flexor muscles of the metatarsus, the tendo Achillis, the external lateral ligaments, the internal lateral, and the anterior and the posterior. The astragalus could then be separated without any effort from its fibulo-tibial socket, and removed with the rest of the foot. The hemostatic means having been applied, I should prefer bringing the lips of the wound together from before backwards, in order that its angles might enclose the points of the malleoli. It is to attain this object that I recommend incising the integuments at some distance from the malleoli and articular indentations, and not close to them as is advised by Brasdor and Sabatier.

B. If the *flaps* should be arranged as Rossi recommends, one upon the inside and the other upon the outside, the flaring of the malleoli would render coaptation utterly impossible, and it would be absurd at the present day to endeavor to cut them out by passing a double ligature through the articulation, as this author professes to have done with success.

## § II.—*With the Astragalus alone.*

M. de Lignerolles has communicated to me an improvement which will probably cause this operation to be received in practice. By leaving the astragalus, and amputating only the os calcis with the foot, we should have, instead of the projections of the malleoli, a large and nearly flat surface at the extremity of the stump, and there is every reason to believe that a shoe or a buskin properly made, would find in this part a convenient point d'appui. In such cases, we should cut the flaps upon the sides, and raise them upon the malleoli, before proceeding to the disarticulation.

[M. Simon, of St. Thomas' Hospital, London, does not excise the astragalus, in amputating at the ankle-joint. He considers the stump thus obtained preferable to that in Professor Syme's operation, as it is broader, while increased mobility and additional length are secured. The results, as witnessed several years after the operation, in one instance, were very satisfactory. G. C. B.]

## PROCESS OF M. SYME.

Mr. Syme (*Cormack's Lond. and Edinb. Month. Jour. of Med. Sc.*,

Feb., 1843, p. 93, &c.) in cases where Chopart's operation cannot be performed on the tarsus, gives a decided preference to amputating at, in other words disarticulating, the ankle joint, and this also on every occasion where, according to old usages, the leg would have been taken off below the knee. To make a better and rounder stump he usually excises the malleoli with a cutting pliers. The plantar flap is made by a transverse incision through the middle of the tissues of the foot, meeting the corresponding dorsal incision directly over and in a line with it, except that the latter has a convexity given to it forward. The thickness of the tissues about the os calcis form a firm support, and the whole contour of the stump is exceedingly well adapted to an artificial apparatus with hinges, straps, &c., to supply the form and motions of the foot.

This operation becomes necessary also (*loc. cit.*) where caries affects the astragalus or os calcis, or as very frequently happens, is seated in the articular surface between these bones, for partial amputation there can be of no avail. Also more especially in those cases of compound dislocation of the astragalus and caries of this bone, with its adjoining articulating surfaces, and for which hitherto amputation of the leg above the ankle had been deemed necessary.

It may be objected, continues Mr. Syme, who has paid great attention to this subject, that when the joint itself is diseased, entire removal of the articulation must be requisite. But, says this surgeon, in what is commonly called disease of the ankle, the joint between the astragalus and os calcis is affected much more frequently than that between the astragalus and bones of the leg; and even where the latter condition really exists, it would be easy to remove all of the bone that is essential for recovery, by sawing off a slice from the articulating extremities of the tibia and fibula, as the caries penetrates to no great depth in the cancellated texture. The advantages at the ankle over that at the knee he considers to be, 1st, The risk of life is smaller; 2d, A more comfortable stump will be afforded; 3d, The limb will be more seemly and useful for support and progressive motion.

The risk of life is less because the parts removed are not so extensive, being but little more than by Chopart's operation; there is less also to fear from hemorrhage immediate or secondary, because the vessels are less and merely branches of the posterior tibial artery and of the anterior tibial near its termination; and the cavities of cylindrical bones not being opened, there is no danger of exfoliation from the dense osseous texture, and inflammation in the medullary veins. (See a case of medullary suppuration in the tibia below.)

The stump too is more comfortable, because it is formed of parts peculiarly well calculated to protect the bone from injury, and not disposed to contract like the muscular tissue; the nerves also being smaller here, their cut extremities will be less apt to enlarge and become the seat of uneasy sensations, while the absence of exfoliation ensures complete union of the integuments over the bones. And the limb will be more useful and seemly from full play being afforded to the movements of the knee joint, without the embarrassment of an imperfect stump.

Mr. Syme therefore strongly advocates amputation at the ankle joint,



as an operation that can be advantageously introduced [revived or generalized he should have said, as it will be seen by the text *supra* and *infra*, and the notes above, that it has been long known. T.] into surgery; and regrets having cut off many limbs that might have been saved by it, (*Loc. cit.*, p. 95—96.)

This surgeon, since the period at which the above memoir was published, has continued to practice this amputation with we believe unvarying success, and by a later communication from that surgeon to the same journal, (Cormack, Aug., 1844, p. 647, &c.,) we are informed that he is more and more satisfied with the decided preference which ought to be given to it, and is happy to find that this method is rapidly gaining ground. He does not, he says, pretend to claim to be the author of it, as it had been performed on the continent he assures us by different surgeons, long before he thought of it. Mr. Syme, however, is we believe fully entitled to the merit of having practised it more frequently than any other person, and as a natural consequence of this, of having made such improvements in the manipulating process, as to have given greater assurance of a successful result where his mode has been adopted. He also intimates in the communication last referred to, that his greater familiarity with the operation at present has enabled him to rectify an error that he labored under at the time he published his first cases.

The best instrument, he says, is a large bistoury or small amputating knife with a blade about four inches long. The grasping of the ankle by an assistant renders a tourniquet entirely unnecessary. In his first operations, he says, his flap was made unnecessarily long. Both incisions should, as before said, be continuous, and exactly opposite to each other, and both of them convex forwards, each convexity reaching to a line drawn round the foot midway between the head of the fifth metatarsal bone, and the malleolus externus; and they should meet a little way farther back, opposite the malleolar projections of the tibia and fibula. Care should, he remarks, be taken to avoid cutting the posterior tibial artery, before it divides into the plantar branches, as in two cases where he did so there was partial sloughing of the flap. These branches nourish the flap, and must be left intact. If the ankle joint is sound the malleolar processes should be removed by cutting pliers; but if the articulating surfaces of the tibia and fibula be diseased, a thin slice of these bones should be sawed off. The edges of the wound should be stitched together and lightly dressed.

[Professor Pirozoff, of St. Petersburg, has so modified Mr. Syme's amputation at the ankle-joint as to obtain a longer stump, and one the extremity of which is better adapted to bear pressure. The cavity of the heel-flap being filled by the posterior extremity of the os calcis which is preserved in this operation, the healing process is accelerated. It is also easier of execution than that performed by Professor Syme. Of course, this proceeding requires a perfectly healthy state of the os calcis. The peculiarity of this modification consists in preserving the posterior extremity of the os calcis as shown in the following diagram which we take from Professor Gunther's "*Lehre von den Blutigen Operationen*" &c. &c. Leipzig, 1853, Taf. 18. Fig. V.



The letters, *a* and *b* represent the line of section of the bone.

Mr. Teale, of Leeds has, recommended another modification of amputation at the ankle-joint (*Lond. Med. Times and Gazette*, May, 1854, p. 539.) The lines of incision in his method allow of the removal of one or more of the tarsal bones, and if necessary, the foot at the ankle-joint. A transverse incision is made across the sole of the foot, commencing about three-quarters of an inch in front of one malleolus, and ending at a similar point in front of the other malleolus. A second incision is then made in the median line, beginning over the tendo Achilles, on a level with the ankle-joint, and joining the former at right angles in the sole of the foot. The two lateral flaps thus marked out being next dissected upwards close to the bones, the calcaneum and astragalus are freely exposed. If from the extent of the disease, other bones of the tarsus require removal, they may readily be reached by extending the median incision a little forwards. In removing the entire foot, the two extremities of the transverse incision may be united by a curved incision across the dorsum of the foot. Mr. Teale refers to an important fact in reference to the attempt to preserve any of the tarsal bones in strumous affections, viz. the articular surfaces may appear healthy while their cancellous structure is in an early stage of the disease. G. C. B.]

Until a recent period, this surgeon says, the leg was generally amputated wherever the disease of the bone extended upwards beyond the metatarsus. In 1829 this surgeon ventured (*Edinb. Medical and Surgical Journal*, Oct., 1829) to adopt Chopart's process in a case of this description where amputation of the leg had been proposed. His success was complete in this and five other similar cases; since when the operation he considers to have been firmly established in Edinburgh.

But Chopart's process cannot reach cases where the caries is between the astragalus and os calcis, or in the ankle joint itself. In the former situations the gouge cannot be depended upon, but in one case M. Syme succeeded by making a breach through this part of the foot, and inserting a seton besmeared with escharotics as red precipitate, &c. But he would rely only on the operation. Formerly, too, the leg was amputated in those complicated dislocations of the ankle joint where the astragalus is displaced from falling with great force on the heel; afterwards the practice was to save the limb, but this is a tedious and dangerous process, as Mr. Syme thinks; for out of 13 such cases at the Royal Infirmary, Edinburgh, only two recovered of those not amputated; besides

which the foot remains stiff, sensitive, and in fact an incumbrance. For all which reasons he advocates amputation at the joint in such cases. (See Mr. Hancock on this subject below.)

Mr. Syme, gives in addition to the six successful cases in which he had already performed this amputation, four others, which make *ten* in all. He considers that there are, in reality, but very few occasions in which it can be necessary to amputate the leg itself above the ankle; having done so himself, viz., below the knee, in only one instance since he adopted the operation at the ankle—this last method being in this one exception inapplicable, from the peculiar circumstances under which the patient was placed.

In fact, malignant tumors of the tibia and fibula require, says Mr. Syme, amputation of the thigh; and compound fractures of the leg, so severe as to demand removal of the limb, hardly admit of the operation being performed below the knee, on account of the soft parts so near the seat of the injury being unfit for the healing action.

The advantages at the ankle (to recapitulate) are, in conclusion: 1st, That there is less mutilation; 2d, Greater utility of the limb; 3d, Much less danger than in amputation of the leg, because the shock must be much less, from the small extent of soft parts removed, being little more than in Chopart's partial section of the foot; because, also, the smallness of the arteries divided presents no risk of serious hemorrhage, while the cancellated texture of the bone exposed is not liable to exfoliate, and the medullary canal remaining entire, inflammation of its contents and also of the veins is prevented.

[Mr. Syme states that the advantages which he originally anticipated from this operation have been fully realized, his experience now amounting to upwards of fifty cases. In addition to its other advantages, such as the formation of a more useful support for the body "than could be obtained from any form of amputation of the leg," he considers that amputation at the ankle joint is almost entirely free from danger to life.

According to Mr. Guthrie, this operation has not answered, in some of the hospitals of London, the expectations entertained of it from its success in Edinburgh, the flap formed from the under parts, or heel, having frequently sloughed (*Commentaries in Surgery*, p. 102). Mr. Syme, however, asserts that this is the fault of the operator, who is not sufficiently particular to make the flap of a proper length, and to preserve the posterior tibial artery intact, until it has divided into its plantar branches. Mr. Guthrie is disposed to think that it is an operation more likely to be eminently successful in military surgery, as the parts are here sound with the exception of the injury for which it is performed.

During the winter of 1846-47, we saw the first case in which amputation at the ankle joint was performed in London, and were much pleased with the appearance of the stump, after it was healed. The operation in this instance, was performed by Mr. Fergusson, and in the last edition of his *Practical Surgery*, (1842) p. 491, he remarks that he has now had considerable experience in this proceeding, and does not hesitate in giving it his strongest recommendations. He adds, "If length of limb and stump, and a perfect covering to the ends of the



bones, be advantages, certainly this proceeding affords them." We know of no instance in which this operation has been performed in this country, but that reported by Dr. John Watson, in the *N. Y. Med. Times*, Nov. 1853. G. C. B.]

In a case related by Mr. Lyon, of Glasgow, (*London Medical Gazette*, May 31, 1844, p. 302,) which commenced with osteitis of the tarsal and metatarsal bones, and in seven months ended in caries, leaving the os calcis and astragalus still unaffected, he proposed Chopart's operation, which being declined, and these bones in another month becoming also involved, he now was induced, as the only resort, to recommend the process of supra-malleolar disarticulation, so strongly recommended and so successfully performed by Mr. Syme, of Edinburgh, according to the useful modifications which the latter surgeon has given to it. This proposal was agreed to. Mr. Lyon was not deterred from proceeding, though the malleolar processes were soft—a condition common in strumous subjects. He made an opening at the most dependent part of the posterior flap, as a *safety valve* for any pus that might collect, recommended by Mr. Syme. A finger's breadth of the anterior flap mortified on the fifth or sixth day and separated, when granulations soon after agglutinated the cellular surface of the flap to the synovial membrane.

Mr. Lyon thinks he erred in applying cold lotions to the wound, as it may diminish too much the vitality of the flap, [the anterior flap, no doubt. T.] which being composed only of skin and cellular membrane, and but loosely connected with the adherent parts, (as in circular amputations,) may, if treated thus, be more disposed to gangrene. Carded cotton and applications of warm water are preferable. The same tendency to gangrene exists in the posterior flap in this method of Mr. Syme, as it is large and thick, and the condensed cellular substance and thick cutis of which it is composed is but poorly supplied with blood, viz., only from the vessels that pass through the skin and cellular substance of the posterior and inferior part of the leg; hence the circulation in these small vessels is weak, and liable to interruption.

To meet these objections, Mr. Lyon properly recommends that the margins of the two flaps should be carefully placed in *close and easy contact*, in order that primitive union may take place, and the blood pass from the anterior into the posterior flap, and thus prevent gangrene; which is the more necessary, since immediate union between the synovial membrane covering the cartilage and the condensed cellular membrane lining the flap is not to be expected. We should, therefore, be careful to employ sutures and plasters, and avoid pressure, compresses, and bandages. Interrupted sutures and short strips of plaster to approximate the lips are eminently serviceable.

M. Stanski, in all cases, prefers the supra-malleolar method to Chopart's operation. He relates an interesting case, (*Gaz. Méd. de Paris*, t. XII., 1844, p. 528—529,) to illustrate this, of a woman aged forty-seven, who, from spraining the left ankle, was attacked with inflammation in the part, which was followed by a large number of fistulous openings about the joint, discharging pus in such quantities as to bring on symptoms of phthisis. The foot was amputated on Chopart's principle, but the retraction was so great backwards, that the cicatrix was

drawn underneath, giving pain on walking, and again became a running sore. M. Stanski now amputated the limb above the ankle, and effected a perfect cure. The reasons why, in his opinion, this operation should always be substituted for Chopart's, appear quite conclusive. The examination of the amputated foot shows us, says M. Stanski, that Chopart's amputation, far from presenting an advantage to the patient, is rather injurious; for, in this operation, the bones of the tarsus being disarticulated almost on the line with the anterior border of the articular pulley formed by the tibia and fibula, the tendons of the anterior muscles of the leg, in supposing even that they took their point of attachment on the astragalus, act on an arm or lever so short, as, compared with that on which the muscles of the posterior region of the leg exercise their action, that they cannot, in any manner, counterbalance the power of these last; and if they are inserted ever so little on the skin, as occurred in the case in question, their action is lost as to the movements of the foot, while the tendons of the posterior muscles, attaching themselves to the lower surface and posterior extremity of the os calcis, preserve all their action. It results from this, that the fibres of these muscles, in retracting, draw up the heel forcibly backwards, and favor, by that, the retraction of the ligaments and aponeurotic fibres which are found behind the tibio-tarsal articulation, and finally draw the cicatrix of the stump downwards—an inconvenience which prevents the patient from resting on his foot, and which cannot be essentially remedied by any mechanical shoe, nor by the section of the tendo Achillis, as was proved also in this case. The greatest obstacle to putting the foot down, however, was the strong retraction of the posterior fibres of the external lateral ligament, which thus kept the foot in permanent extension. Therefore, to bring the foot down to its place, it would have been necessary not only to make the section of the tendons of all the muscles of the posterior region of the leg, but also, and perhaps principally, of the posterior fibres of the external lateral ligament, in order to replace the astragalus back into the articular pulley of the tibia and fibula, from which it had become evulsed, and to keep it there in spite of its powerful tendency to escape from its position.

[M. Lucien Boyer exhibited very recently, to the Academy of Medicine of Paris, May 20, 1845, (see *Gaz. Méd.*, Mai 24, 1845, p. 332,) a striking illustration of the advantages of the new apparatus of M. Martin, so much extolled by M. Velpeau, (see *supra*,) which is adapted to the leg in amputation at or above the malleoli. The case exhibited was a young boy, aged ten or twelve, upon whom M. Boyer had performed this operation, and who, with the aid of M. Martin's apparatus, could walk, run, leap, and make every kind of evolution, almost with as much facility as if he had had a natural limb. T.]

#### ARTICLE VIII.—AMPUTATION OF THE LEG.

Though amputation of the leg is now less frequently performed than formerly, it is often rendered indispensable, from diseases of the tibio-tarsal articulation, complicated fractures, wounds from fire-arms, gangrene, &c.

§ I.—*In the Continuity.*

The rule which advises that we should amputate as far from the trunk as possible, has been but rarely applied to the leg. The point selected for the division of the bones, even in cases where the disease has not extended above the lower articulation, is at two or three fingers' breadth from the tuberosity of the tibia. The tendinous expansion of the sartorius, gracilis, and semi-tendinosus muscles, is by this means preserved. The stump not only possesses flexion and extension, but is of sufficient length to enable the knee to rest firmly and without any inconvenience upon an artificial leg. It is easy, also, to obtain a sufficiency of soft parts to cover the wound. We may, nevertheless, when the disease does not extend above the tibio-tarsal articulation, amputate the leg either in its lower or upper third.

A. *Amputation at the Lower Third.*—As we approach the malleoli, we ultimately meet with nothing but integuments. The cicatrix is formed with difficulty, continues in a state of tension, and is easily ruptured. After the cure, the stump being too projecting behind, is constantly exposed to strike against external objects, and thus becomes more annoying than useful; to such a degree, in fact, that many persons operated upon in this manner, have themselves requested a second amputation, of which cases Sabatier gives examples, and which had already been previously noticed by Paré, (*Œuvr. Compl.*, liv. XII., ch. 29, p. 358.) Higher up, the saw traverses the tibia in its spongy and thickest portion. The fibrous expansion, known under the name of the pes anserinus, [see a note on this, Vol. I.,] might be wounded, which would impair the action of certain muscles of the thigh upon the stump. Such, at least, are the arguments which for a long time past have been adduced in support of the precept which has just been given. Nevertheless, V. Solingen (*Man. des Opér. de Chir.*, p. 240) has vigorously opposed this doctrine. According to him, we should amputate the leg like the fore-arm, as low down as possible. By employing a shoe, supported by two thin and polished blades of steel, which are fixed upon the sides of the leg by means of cogs properly adjusted, patients walk almost with as much facility as with their natural foot. Many foreign surgeons at that epoch concurred with him in opinion, nor did Dionis (*Démonstr. des Opér.* &c., p. 742, 9e dém.) differ widely from him. However, there was no longer any discussion upon this process, when Ravaton, (*Journal de Vandermonde*, t. V.,) White, (*Cases in Surgery*, 1770,) and Bromfield, (*Obs. and Cases, &c.*, 1773,) about the middle of the last century, imagined that they had discovered it. Like Solingen, these authors extolled the employment of machines, those among others of Wilson, (Rossi, *Méd. Opér.*, t. VI., p. 219,) designed to admit of flexion and extension of the leg, and of walking, in fact, in the same way, as with the natural limb. Ravaton's buskin, secured by means of leather straps, left a slight void under the point corresponding to the cicatrix, in order to avoid compression upon it. But Sabatier objects, with reason, to this mode, because the weight of the body must thereby force the integuments upon the extremity of the stump to mount upwards, and thus continually make tractions upon the cicatrix until it is



torn. M. Larrey expresses the same opinion of it. Vaceca, (Salem, *Méd. sur l'Amput.*, etc., 1829,) Brunninghausen, (Soulera, *Thèse*, t. XIX., 2e partie, Strasbourg, 1814,) and M. Soulera, (Soulera, *Thèse*, Strasb., 1814,) have, notwithstanding, ventured in our days to revive this practice. Rossi, also, (*Méd. Opérat.*, t. II., p. 205—219,) in his book, on two different occasions, does not hesitate to recommend it. Lucas and Alanson, (*Man. de l'Amput.*, trad. par Lassus,) in imitation of White and Bromfield, also amputated the leg in its lower third, which amputation is likewise recommended by Platner, Delaroeche, (*Encyclop. Méth.*, part. Chir., t. I., p. 99,) and by Benjamin and Charles Bell, (*System of Operative Surgery*, 1807,) and was performed by Wright in three cases.

I. It must be confessed that *amputation* of the leg in its lower portion, is, from the small quantity of soft parts found there, a much less serious operation than in the place of election. The teguments that may be preserved, suffice for reunion, even by the first intention.

We cannot assert that it is impossible to construct machines of a sufficient degree of perfection to simulate the portion of the limb destroyed, and to allow of walking, in such manner as to render the deformity almost imperceptible. Solingen, White, Ravaton, Bell, Bromfield, and many other German surgeons, relate facts which prove the contrary. Because some patients have done badly under this operation, it by no means follows that it is to be rejected for all the others. Success in such cases must depend upon many circumstances, which, in my opinion, have not been sufficiently weighed. The cicatrix may be more or less firm, or it may be placed at the centre or at the circumference of the stump. Though it may be true that buskins have not yet received all the perfection desirable, it does not follow that human art may not attain this point. The two patients thus operated upon who have fallen under my observation, are enabled to walk by means of so imperfect a buskin, that it is difficult for me to conceive of the absolute necessity of making use of the knee as a point d'appui for an artificial limb. I come to the conclusion, therefore, that in persons who are not obliged to make long and fatiguing marches, and who attach much importance to the natural form of the leg, or to the appearances of a natural conformation, amputation by the method of Solingen, might occasionally be adopted. There would be an advantage, as I conceive, in such cases, to divide the integuments in such manner that the cicatrix might be thrown behind, and not upon the central part of the stump.

Since the year 1831, the epoch at which I held this language, amputation at the lower third of the leg has been reintroduced in practice. M. Keate, (Lenior, *Thèse de Conc.*, 1835, p. 24,) of London, has declared himself an advocate for it on certain occasions; M. Ribéri, who treats of it at great length in his work on amputations, states that he has performed it five times with success. Public attention has been again awakened upon this subject, by more ingenious and perfect machines, first by M. Mille, (*Journ. Hebd.*, 1835, t. II., p. 161,) and then by M. Martin, (*Bulletin de l'Acad. Royale de Méd.*, t. I. et II., 1837,) than the buskins that were first in use. M. Goyrand, (*Journ. Hebd.*, 1835, t. II., p. 261,) at Aix, has performed it four times, and been well satisfied of it. I was the first that had recourse to it at Paris, (Dufresse,

*Journ. Hebd.*, 1835, t. IV., p. 129,) viz., in June, 1835, in a patient who had had his foot crushed, and who recovered. M. Roux, (Garavel, *Thèse* No. 331, Paris, 1837,) M. Blandin, (*Ibid.*) and M. Serre, (*Compte-Rendu de la Clin. de Montpellier*, 1837,) also soon after employed it. These new facts, moreover, are in accordance with the judgment I have given above. (exhibited at the Hospital of La Charité, a young girl operated upon by M. Blandin, and who, by means of M. Martin's buskin, walked with great freedom, ascended and descended the stairs without trouble, and could leap upon a chair, so as, in fact, to completely mask her mutilation in the eyes of the spectators. Nevertheless, this apparatus is still too complicated, is too much in need of the supervision of a skilful mechanic, and is too dear to be attainable by most persons. Where this is to be used, I should recommend amputations at the lower third of the leg, in those only who live in cities, or are in easy circumstances. Working people, and those who have to perform severe labors, and who, the greater part of the day, have to be on their feet, or walking, are more at their ease, and more secure with the old drum-stick under the knee, than with the buskins of MM. Mille and Martin.

[The views of our author are more fully expressed in his Report to the Academy of Medicine, October 12, 1841, on a memoir addressed to the Academy by MM. Arnal & Martin, entitled : *De l'Amputation sus-malléolaire de la Jambe, comparée à l'Amputation au lieu d'Election*, (See *Journ. des Conn. Med-Chir.*, de Paris, Novembre, 1841, No. 5, p. 215-216.)

The following, says M. Velpeau, are the propositions which these physicians establish in favor of supra-malleolar amputation :—

1. It may be performed with more promptitude and facility than the ordinary operation ;

2. It causes less pain ;

3. It is less frequently accompanied with gangrene of the flap, so common in the ordinary method ;

4. It exposes to less risk of secondary hemorrhages ;

5. The traumatic fever which it causes is milder and less violent ;

6. The cicatrization is more rapid ;

7. In consequence of the rapid cure of the wound made by the amputation, it is less liable to be attacked with hospital gangrene ;

8. The accident of *conicity* of the stump follows it less frequently ;

9. The patients are less frequently attacked with purulent absorption ;

10. In conclusion, the patient, after the cure, is less exposed to the accidents of general plethora, and can make a more free use of his limb.

MM. Arnal and Martin had obtained from the practice of twenty-five surgeons a collection of *ninety-seven* cases of supra-malleolar amputation, of every diversity of condition, as respects sex, age, disease and country. Out of these ninety-seven cases, there were *eighty-seven of complete cure*, that is, the proportion of the cures to the deaths is as nine to one ; while Dupuytren admits, that in amputation at the place of election, one dies out of every four cases.

Considering all the above propositions separately, M. Velpeau comes to the following conclusions :

1. Supra-malleolar amputation is manifestly less dangerous than that which is practised at the place of election.

2. It is practicable to adapt to the limbs which have undergone this operation, prothetic (i. e., substitute) means which allow of walking and of concealing the deformity.

3. The artificial limb which possesses the most advantages is that which has been devised and constructed by M. Martin.

4. By means of this artificial leg a patient is enabled to walk, sit down, get up, ascend and descend a stairs, in a word to execute all the movements required in the occupations of social life.

5. In those who have it not in their power to procure such a substitute, the question still arises, whether supra-malleolar amputation ought to be preferred to the other.

6. It would be a discovery of the highest interest to find a cheap substitute which would fulfil all the conditions required to allow of the movements of the limb.

M. Gimelle stated that after the return of the French army from Russia, about thirty to forty patients who had been amputated above the ankle, were received into the Invalides, and that out of this number such was the inconvenience of the stump, that twenty-one or twenty-two submitted to the amputation at the place of election. As a further argument in favor of the latter operation, M. Gimelle remarked that M. Pasquier at the Invalides had not lost a single case out of *thirty-four amputations* at the place of election.

M. Larrey at the same sitting of the Academy maintained that in those operations he cured eight or nine out of ten; and had, before M. Pasquier, obtained nineteen successful results by this mode of operation; that when on the contrary we amputate near the malleoli, we cannot look for reunion by the first intention; for it is necessary before the wound can close that the osseous extremities should become smoothed away and rounded off, which necessarily requires a very long time.

M. Velpeau replied: It is well ascertained at the present time that in amputation at the place of election, the proportion of deaths is as one to four or five; while in supra-malleolar amputation it is about *one in ten*. This then is one great advantage; for it is something, according to my ideas, to lose *one-half* less of our patients. I can state that the five persons on whom I have performed this operation, have recovered the use of their limb to such extent, that it is scarcely possible to imagine that they had undergone an operation. A lady upon whom I performed it lately met me in the street, says M. Velpeau, and I could scarcely recognize her, for nothing in her step differed from that of other persons. She has been enabled this winter to attend balls and to dance. I don't pretend to say, continued the Professor, that she has made any extraordinary *pas*, (*entrechats*,) but she has certainly engaged in many country dances. The thanks of the Academy were returned to the authors of the memoir, and it was sent to the committee of publications: the Academy, so far at least, expressing their concurrence with MM. Arnal, Martin, and Velpeau. T.]

II. *Operative Process*.—Many processes have been employed in amputation of the leg at its lower third.

a. *Various Processes*.—M. Salemi recommends that we should cut



the flap behind, and of sufficient size to cover the wound. M. Robert, (Bérard, *Dict. de Méd.*, 2e édit. t. XVII., p. 260,) by this mode, cured his patient in thirty days. After having divided the skin circularly, M. Blandin, (Garavel, *Thèse* No. 331, Paris, 1837,) made a longitudinal incision in front and behind, in order to have a flap on each side. Others, as M. Lenoir for example, have proposed, after having divided the integuments by the circular method, to raise them up in front like a ruff, to the extent of an inch, and to confine ourselves to the division of their connections in proportion as they are drawn back. The facts are not yet sufficiently numerous to enable us to appreciate the relative value of these different processes. That of M. Blandin originates from the process of M. Larrey, and that of M. Lenoir from the process of Sabatier for amputation of the leg at the place of election, and neither have any greater or less value above the malleoli than below the knee.

*b. Process of the Author.*—An assistant compresses the artery at the pubis, or applies the tourniquet at the lower third of the thigh. A second assistant supports the foot, while a third seizes the leg, and prepares to raise up the integuments.

The surgeon, placed indifferently either upon the outside or the inside, circularly divides the skin as near as possible to the base of the malleoli, and raises it in the manner of a ruff, to the extent of an inch and a half in front, and an inch only behind. He then proceeds to the section of the tendo Achillis, and then to that of the anterior and lateral tendons, at the base of the cutaneous fold. The inter-osseal knife is generally not required, since at this point the two bones are separated only a few lines apart. It is with the point of the bistoury, therefore, that we complete the division of the soft parts. If the split compress [the retractor] is used, it should have but two tails, and should be made to embrace the limb obliquely from without inwards. The section of the bones has nothing peculiar, except that it is almost useless to remove the upper angle or inner border of the tibia, as is sometimes done at the upper third.

The only arteries that require the ligature or torsion, are the anterior and posterior tibial and the fibular. The integuments being now brought down, are united together from before backwards and from without inwards. In bed the stump is kept extended or moderately flexed upon a large cushion. The consequences are nearly the same as in the upper third of the limb, except that the reaction here is less, and the cure generally more prompt.

*B. Amputation of the Upper Third.*—Some persons have placed the point of election (vid. supra) either higher up or lower down than I have given it above. Hey, for example, fixes it at the middle of the limb. M. Garigue, (*Thèse*, Strasbourg, 1836,) on the contrary, proposes, as De la Motte (*Traité de Chir.*, t. II., p. 334, Obs. 313, edit. Sabatier) and Bromfield had advised before him, that we should amputate much nearer the articulation, and even above the tuberosity of the tibia. M. Larrey (*Clin. Chir.*, t. III., p. 557) strongly advocates this plan, which M. Guthrie (*On Gunshot Wounds*, 1815) also formally approves of, and which Percy and Malvini, it is said, (*Mém. de l'Acad. Royale de Méd.*, t. II., p. 12) were the first to recommend.

I. The point where these surgeons amputate, however, should be con-

sidered rather one of *necessity* than of election. Viewed in this light, I agree with them in opinion. If it were not advisable to amputate at the knee, I should always prefer amputation of the leg, if it were only at an inch below the articulation, rather than amputation of the thigh. I am even of opinion that it would be better, as a general rule, to make the section of the bones immediately below the tuberosity of the tibia, than at the place where it is usually preferred. The section of the tendons of the sartorius, the gracillis, semi-tendinosus, and ligamentum patellæ would not prevent these organs, in the end, from retaining their action on the upper extremity of the leg. In this part there is no longer any inter-osseal space. The popliteal artery is the only one which has to be tied; or, at least, there are no others but the fibular and posterior tibial which may properly require this assistance. The head of the fibula may be removed. The amputation of the leg then resembles that of the limbs where there is but a single bone. The spongy state of the tibia, far from being an inconvenience, presents, on the contrary, the advantage of rendering the development of the cellular granulations more easy and more prompt. It must, however, be admitted that integuments only are found in the anterior half of the circumference of the leg at this place, while, farther down, the muscular tissues come to their assistance; but, as it is the integuments definitively which always shut up the wound, I cannot see what great evil can result from it. In conclusion, did not the spongy substance of the tibia, in contact with the pus, expose to phlebitis and to the resorption of morbid matters; and did we not, in operating above the head of the fibula, run the risk of opening into the synovial membrane of the knee joint, which membrane is sometimes prolonged as far down as that point, of which M. A. Bérard has communicated to me two examples, of which I myself have now seen a number of instances, and which M. Lenoir (*Thèse de Concours*, etc., 1835, p. 7) has noticed in twenty-four subjects, I would, without hesitation, adopt the method of MM. Garigue and Larrey.

In order, when the disease is very near the knee, to preserve the inferior attachment of the ligamentum patellæ, and to leave intact the mucous bursa which is found behind it, M. Larrey proposes moreover that we should direct the saw more or less obliquely from below upwards, and from before backwards. We may in this manner remove all the fibula and leave a small portion of the tibia which will prove equally useful as a point d'appui to the artificial leg; but in such cases the better practice appears to be to amputate at the joint.

II. *Anatomy*.—After the details above there can be no necessity of giving a long description of the leg. The tibia being thicker than the fibula, and situated on a much more elevated plane is the reason why the greater thickness of the leg is in the direction from within outwards and from before backwards, instead of being transverse. Its inner side being entirely unprovided with muscles, cannot after amputation, whether by the circular or flap method, be covered except by the integuments. Its sharp edge which forms a sort of crest in front, usually gives to its section in this part a very acute point, which may perforate the skin, if it is not attended to. In the lower part of the calf the conical form of the limb gives to the integuments when cut circularly too narrow an opening to be easily raised up, while above, this opening represents rath-

er the mouth of a funnel. The tibialis anticus muscle, the extensors of the toes and the peroneus tertius, which fill up the outer inter-osseal fossa, and adhere almost to the whole extent of this cavity, are incapable when divided of retracting beyond a few lines. It is the same with the peroneus longus and brevis muscles, and with the deep muscular layer, or the tibialis (posticus) and flexors of the toes which fill up the posterior inter-osseous fossa; while the gastrocnemii and even the soleus, should we amputate very low down, might retract considerably. The anterior tibial artery bending at a right angle at the moment it arrives upon the front part of the inter-osseous ligament, soon also associates itself with the nerve of the same name. The posterior tibial and peroneal arteries which separate sometimes lower down and sometimes higher up from the peroneo-tibial are almost always met with,—the first behind the external border of the tibia upon the posterior surface of the flexor longus digitorum pedis and tibialis posticus muscles, the second behind the fibula, in the midst of the fibres of the flexor longus pollicis pedis. M. Lenoir, (*Thèse citée*, p. 8,) who maintains that the nourishing artery enters into its groove at two inches and a half, and into its canal, which itself is generally an inch long, at two inches and a half or three inches and a quarter below the tuberosity of the tibia, proves by that fact, in corroborating the assertion of Deccourcelles, (*Manuel des Opérat.*, etc., p. 387,) that this artery is divided in the thickness of the bone, even when we amputate at the place of election, and outside of the tibia when we amputate a little higher up; and also that we are certain to avoid it by following the rule of M. Larrey. Moreover the nerve is almost constantly found situated upon the fibular side of the tibial artery.

III.—*The Operation.*—The leg may be amputated either by the circular or flap method.

a. *Circular Method.*—I. *Process of the Author.*—The patient, being placed upon a bed or operating table, is to be supported there in a proper manner.

*First Stage.*—To guard against hemorrhage, compression is to be made on the femoral artery, on the body of the pubis, or against the inner side of the femur on a line with the little trochanter, or finally by means of a tourniquet or garrot. The garrot or tourniquet is to be preferred when there are not a sufficient number of assistants, or when we cannot rely entirely upon them. These instruments are applied upon the thigh with so much the greater advantage, inasmuch as they cannot in any manner interfere with the surgeon while he is amputating the leg, and that they serve also to diminish the pain and benumb the limb.

The operator ordinarily places himself on the *inside*; this is a general rule which has been long established. The reason given for it is, that it is more easy in this manner to complete the section of the fibula before we have got through the tibia, than if we were placed on the outside. Ledran, however, has remarked that the surgeon may dispense with this rule without danger, and even perhaps with some advantage. Graefe and M. S. Cooper, on the other hand, maintain that it is full as advantageous to be placed always on the outside, or that it is at least not necessary to be on the inside for amputation of the right leg. If, in fact, when on the inside and operating on the left leg, the correspond-



ing hand being towards the upper part of the limb, is enabled to raise up the integuments in proportion as the right hand divides them; this cannot be done upon the right leg if we follow the rule laid down. Consequently the precept which it would be proper to substitute for the ancient one, and which I have myself conformed to for a long time past, in this:—*The operator is to place himself in such manner that the left hand may always grasp the leg on the side towards the knee*, unless however he should be ambidexter; in fact in this last case there would no longer be any more necessity for his placing himself between the two limbs than upon the outside of either. It would, moreover, be puerile for the surgeon to place himself outside, for the division of the soft parts, and then within when the bones only remain to be divided, as some English and German surgeons have recommended. Still more out of character would it be to leave the sound leg between the operator and the one to be amputated, in order never to place himself between these parts. The foot being wrapped in a fold of linen, is with the entire diseased portion of the leg confided to the last assistant.

*Second Stage.*—The operator, provided with an amputating knife, cuts circularly through the whole thickness of the skin, commencing at the crest and finishing at the inner border of the tibia; he then, by means of a second cut, unites the two extremities of this incision on the inner face of the bone, unless by a movement of rotation of the hand upon the handle of the instrument, and which I have already described, he should prefer passing round, without stopping, the whole circumference of the limb. Drawing back with his left hand the integuments thus divided, he detaches their cellular bridges, and raises them an inch or an inch and a half, or with the thumb and forefinger he seizes them by the upper lip of the wound, near the fibula. Then he dissects them with free strokes by means of the point of a knife or a bistoury, and promptly reverses them from below upwards, in order to form a sort of border or ruff.

*Third Stage.*—Having brought back the knife to the base of this catenous ruff or circle and to the same point on the tibia, the operator incises from before backwards, and from within outwards, so as to divide the aponeurosis and all the muscular fibres which rise above the level of the anterior inter-osseous fossa. Depressing the wrist, he divides in the same manner the peronei muscles, and then in gradually bringing the knife inwards, those of the calf or posterior surface of the leg, and again brings the instrument in front and detaches the aponeurosis on each side; then immediately applies its heel on the outer surface of the fibula and proceeds to cut from the handle to the point. When the point arrives upon the inner side of this last bone, we cut through the inter-osseous space, in order to divide all the deep-seated fibres, and while withdrawing the instrument to divide also on the outer surface of the tibia. Replacing the knife below the limb and upon the same point of the fibula, the operator now again brings it back upon the posterior surface of this bone: again traverses the inter-osseous space, and comes out from it in the same manner as in front; divides all the remaining muscles behind the tibia, and finds that he has described in this manner a perfect figure of 8, as has been said in speaking of amputation of the fore arm. It is advisable, as in this last-mentioned member, to make a

second cut with the bistoury on each border of the inter-osseous membrane. We then pass from behind forward and between the bones, the middle tail of the compress split into three tails; the different parts of which properly unrolled and then united are confided to the assistant who is charged with holding back the muscular tissues.

*Fourth Stage.*—The surgeon fixes the nail of his thumb at the spot where the tibia has been denuded, and applies the saw to this point, making at first only small cuts. He then elevates his wrist so as to complete the section of the fibula first, finishing with that of the bone upon which he commenced; since the fibula if alone would not present sufficient resistance to the action of the saw, and would also have its upper articulation exposed to a severe concussion. This last reason I think is far from conclusive, but the first is sufficient to justify the precept. As soon as the section of the fibula is completed, the assistant, who holds the lower part of the leg and the operator who embraces with his left hand the upper part, should take care to compress this bone with such firmness that it can no longer be shaken by the movement of the instrument. M. Roux advises to saw it higher up than the tibia; for which reason he inclines the saw obliquely upwards and outwards. By this mode of procedure M. Roux thinks he places himself more securely on his guard against the subsequent protrusion of the fibula. This is a matter of little importance, and the section of the two bones on the same line is full as good. Much less can I understand why some in imitation of certain practitioners should recommend their section separately. In fact, to render the section of the fibula more easy, if the surgeon were placed on the out instead of the inside, all that would be necessary would be, after tracing out a groove of proper depth on the principal bone, (tibia,) to have the aids turn the leg into pronation and to make a slight depression of the wrist.

*V. Fifth Stage.* *The anterior angle of the tibia*, upon which the skin is supported, and against which it is pressed by the weight of the muscles of the calf, which tend to drag it backwards after the dressing, sometimes causes perforation of the tegumentary coverings. Surgeons have early thought of the means by which such a difficulty might be prevented, and which is ordinarily avoided when amputation is performed very high up on the limb. I have seen MM. Richerand and Cloquet, at the Hospital of St. Louis, obviate it when it threatened, by applying a piece of pasteboard in the form of a splint to the posterior surface of the stump. A much surer method consists in removing with a cut of the saw the corner of the angle or the osseous border itself. It is not known to whom belongs the first suggestion of this improvement, unless it be to Assalini, who I believe first speaks of it in his *Manuel of Surgery*. Military surgeons have been for a long time in the habit of practising it. It was pointed out in the beginning of this century by an army surgeon, whose name has escaped me. M. Marjolin also, and Bécлар, in teaching it in their lectures, have caused its adoption among French surgeons. MM. Guthrie, S. Cooper, and other English practitioners, have also long since made mention of it, without however appearing to accord to it any very great importance. In place of the anterior angle it is the inner border, it is said, that M. Sanson saws off, but there can be no fixed rule in this matter. Whether it is the border or the angle,

what to do is to remove the salient point, and that constitutes the whole affair. I have often adopted and often omitted it, and have noticed that it was only really necessary in thin persons with flabby integuments, and when we amputate rather low down. Perhaps in such cases it might be advisable to follow the plan of M. V. Onsenort, who before rounding off the cut surface of the tibia dissects a flap from the periosteum, with which he covers the end of the bone.

2. *Process of Sabatier.* The process of M. Sabatier only differs from the preceding in this, that this author prefers incising in the first place the integuments upon the anterior half of the limb, and that we should draw them back before continuing the circular incision a little higher up behind. His reason is, that on the calf the skin retracts with the muscles, while in front of the tibia and of the anterior aponeurosis it will go up no higher than it is raised up by force. This is a modification which, without having any thing objectionable about it, has nevertheless generally been neglected. Decourcelles (*Man. des Opér.*, etc., p. 385, 1756) obtained the same result by keeping the limb flexed while he incised the integuments in front.

3. *Process of Physick.*—M. Ch. Bell considers himself the inventor of a process which Dorsey (*Elem. of Surg.*, t. II., p. 317) ascribes to Physick, but which rather belongs to Decourcelles, (*Opérat.*, p. 385,) and which is as follows: first the skin is divided, then the muscles of the calf are cut very obliquely from below upwards, completing the circular section much nearer the knee on the anterior half of the leg, and terminating the operation as in the ordinary mode.

4. *Process of B. Bell.*—M. Baudens (*Thèse No. 51*, Paris, 1829) after having circularly divided the soft parts, proposes that we should detach all the muscles to the extent of an inch or two, with the point of the knife held in a direction parallel to the axis of the bones. This advice which was given by Bell, and which has been adopted by M. Champion in amputations of the arm or thigh, and for all amputations in general, may have its advantages, and is in concurrence with the precept lately revived with much earnestness by M. Hello, (*Thèse No. 258*, Paris, 1829.)

5. *Dressing.*—In operating at the place of election, we have in succession to seize the *anterior tibial artery*, associated with its nerve, and which must be separated from it in front of the inter-osseous ligament, between the tibialis anticus muscle and the extensors of the toes; then the posterior tibial artery, the peroneal and some branches of the surales, and sometimes also the nourishing artery of the tibia.

Very frequently the first of these vessels retracts far into the tissues, the reason of which, according to M. Ribes, (*Mém de la Soc. Méd. d'Emul.*, *Arch. Gén. de Méd.*, 2e sér., t. III., p. 199,) is found in the double curve which the artery is obliged to make, in order to get in front of the inter-osseous ligament. M. Gensoul (*Thèse No. 109*, Paris, 1824) on the contrary thinks that this [apparent] retraction is owing to the fact that the muscular fibres which surround the artery, being too adherent to mount upwards, make the vessel appear to retract much more than it in reality does, much more even than those of the posterior part of the limb which the muscles draw up still higher. The difficulty of finding this artery, according to M. Sédillot, (*Gaz. Méd. de Paris*, 1833,



p. 363,) is owing to the knife mashing and bruising it in dividing the muscles of the inter-osseous space. Without absolutely rejecting the first and third of these explanations, I would more willingly adopt the second. When the section of the bones is made immediately below the tuberosity of the tibia, one trunk alone replaces the posterior tibial and the peroneal, but then we meet also with the nourishing artery which here possesses considerable volume. Higher up still the anterior tibial itself may not have yet separated from the popliteal, [*i. e.*, strictly speaking, from the *peroneo-tibial* trunk of the popliteal, which trunk and the anterior tibial form the two great divisions, *i. e.*, the bifurcation of the popliteal itself. T.] which last artery alone [*i. e.*, the popliteal] in that case requires a ligature, together with the inferior articular and the surales.

Practitioners differ also as to the *direction which should be given to the union of the wound*. In France it is almost always obliquely from within outwards and from before backwards, as is recommended by M. Richerand. Many operators in England, among others M. Hutehinson, still unite the wound as formerly, directly from before backwards, hoping by this means to avoid the stagnation of the fluids and the pressure of the point of the tibia against the skin. To give in fact greater security to this method, M. Larrey advises to slit the skin in front and behind, to the extent of half an inch. There are others again who unite transversely after the recommendation of M. Guthrie; but there can be no question that if we have adopted the precaution of removing the angle of the bone as has been pointed out, that the method of M. Richerand is the best; and that this alone enables us to bring the tissues in a line with the smallest diameter of the limb, and that it presents in no way any obstacle to the discharge of the pus.

If the amputation has been made very low down, the leg should be supported upon a cushion, and kept slightly flexed and inclined upon its outer side; otherwise we place the stump upon small pillows which raise the ham much higher, and prevent the wound from pressing against the mattress.

II. *The Flap Method*.—It was to the leg particularly that Lowdham, Verduin, Sabourin, &c., were desirous of applying their method. It was upon this part of the limbs also that Garengot, De la Faye and Le Dran made their first trials. But Louis, Lassus and Sabatier, having undertaken to establish the circular method, and the flap operation seeming to be more painful and difficult, it was almost entirely renounced. It is now, however, near thirty years since it was again revived among us by M. Roux and Dupuytren. Hey in England, and Klein and M. Benedict in Germany, who eulogize it much, succeeded in causing its adoption by some of their countrymen. Heliodorus (Peyrilhe, *Hist. de la Méd.*, in 4to, p. 392—393) also, who first divided the soft parts in front, then sawed the bones and finished with the section of the muscular masses behind, did he not follow the flap method, he who so accurately applied to supernumerary fingers the so called method of Ravaton? What appears, however, to have chiefly deterred the moderns from it is the size of the tibia, whose inner face, taken in whatever way we choose, can never be covered by any thing but the skin. The necessity, also, of taking the greater portion if not the whole

of the flaps from behind, was another motive for its exclusion. As, however, there may be cases where it becomes indispensably necessary, I believe it my duty here to point out the principal processes by which this operation may be performed.

*a. Process of Verduin.*—A two-edged knife, plunged into the leg at a point a little below where we intend to apply the saw, first cuts out at the expense of the calf, a semi-lunar flap of about four inches in length; the instrument being then brought in front is immediately afterwards made to divide the integuments and muscles as in the circular method, at the base of the flap which has been raised up; the inter-osseous fossæ are then cleared out and the bones sawed as in the usual way.

Loder and M. Graefe (*Rust's Handbuch der Chir.*, t. I., p. 569) have modified this process in this, that in order to leave a less quantity of muscle they draw the skin back forcibly while making the incisions, and also preserve a small flap in front.

*b. Process of Hey.*—In order to be more sure of the length of the flap, Hey advises to mark out the middle of the upper part of the tibia by a circular line, then to trace out a second an inch lower down, and then a third at four inches below the first; afterwards he makes two others, one on each side, parallel to the axis of the limb, and which are drawn from the union of the two anterior thirds with the posterior third of the superior circular line down to the lowermost circular line. The first indicates the point where the bones are to be sawed; the second that at which the integuments are to be divided in front, and the third the place where the knife must be arrested; while the two lateral lines give the form and extent of the flap; which in other respects Hey cuts out in the same way as Verduin and Lowdham. No one I should judge among us would be tempted to follow this scaffolding of geometrical lines and rules.

*c. Process of Ravaton.*—The circular incision made at four inches from the place where the amputation is to be performed, allows of another being placed on the inner side and near the inner border of the tibia, then a third on the outer border of the leg, and both of which are to fall upon the first at a right angle. The two square or trapezoidal flaps, one anterior the other posterior, which result from these incisions, are then to be dissected from below upwards and raised up; nothing more remains to do than to clear out the inter-osseous space, introduce the split compress and saw the bones.

*d. Process of Vermale.*—In order to form the first flap, Le Dran (*Opérat de Chir.*, p. 55) who states that he has performed the method of Ravaton and Vermale successfully, carries the knife from the inner to the outer side of the leg, and thus begins by forming the anterior flap; nothing then is easier than to draw back a little the fleshy tissues behind and cut out a posterior flap.

*e. Process of Dupuytren.*—Instead of commencing with the anterior flap, Dupuytren first plunges his instrument between the posterior surface of the bones and the soft parts, taking care to leave more tissues behind the fibular than Le Dran did.

*f. Process of M. Roux.*—As it is next to impossible to preserve as much of the tissues in front as behind, M. Roux has proposed to make an incision on the inner face of the tibia about 2 inches in length, which

commences upon the inner border and runs obliquely from behind forwards, and from above downwards, and terminates on the anterior border of the bone. This incision, when the posterior flap is formed, readily allows of our bringing the edges of the wound up to a level with the crest of the tibia, and of making a flap in front which possesses greater regularity and thickness.

III. *Ovalar Method*.—By slightly modifying the circular method for the leg, we may easily transform it into the ovalar. For this purpose it is sufficient to divide the skin in such manner that one of the extremities of the antero-posterior diameter of the incision, shall be manifestly placed nearer the thigh than the other. Thus M. Baudens (*Clin. des Plaies d'Armes-à-feu*, p. 50,) who extols this method, places the apex (sommet) of his oval behind towards the ham; while M. Sédillot (*Gaz. Méd. de Paris*, 1833, p. 363) recommends that it should be in front towards the knee.

IV. *Appreciation*.—All the flap processes in fact are reducible to that of Lowdham and that of Vermale, the one allowing of but a single flap, the other furnishing two. When the skin is degenerated much higher up in front than behind, and that we are obliged to amputate very near the knee, the first is the process that becomes necessary. I have seen M. J. Cloquet employ it successfully at the Hospital of Perfectionnement, upon a patient, who but for that would have evidently lost the thigh. Under all other circumstances, the method with two flaps appears to me more suitable, though it be a little more difficult. When there is only one flap we are obliged to make a right angle with it near its base in order to apply it against the bones. Immediate and complete union is next to impossible; and sufficiently acute pains rarely fail to come on. The accidents which may result from the method in question, justify to a certain extent the fears of surgeons of the present day, and their repugnance to undertake it. By means of two flaps on the contrary we can easily close the wound; the parts being neither angulated nor drawn upon, are found in the conditions the most favorable possible for immediate reunion.

In *making trial* on the dead body with the process of Vermale, and which I have once at the Hospital of Saint-Antoine employed on living man, I omit the small preliminary incision of M. Roux; but I take care to embrace with the left hand the two sides of the leg, and to draw as much of the integuments as I possibly can towards the front. The point of the knife is then directed upon the inner face of the tibia; brought up to a line with the crest of this bone, while pushing the skin before it; passed along in front of the inter-osseous ligament; a little raised up in order to pass in front of the fibula, and again inclined backwards, while the operator draws the tissues towards him, at the moment the knife is cutting through the outer border of the limb. The flap being thus out, we return to form a similar one behind, while the rest of the operation being based upon the process of Dupuytren, presents nothing peculiar.

In whatever manner we proceed, it is necessary that the inner angle of the wound should not be quite as high up as the other, if we do not wish to run the risk of denudation of the bone and necrosis. As a general rule, the circular method merits the preference over the flap



process, but this last presents advantages which we may profit by, when either at the lower or upper third, the soft parts on the periphery of the leg have degenerated much higher on one side than the other. By enabling us to preserve what is sound, it puts it in our power also to avoid removing so large a portion of the bones. The same may be said of the ovalar method. As to immediate reünion, which some of these processes are said to effect with more certainty than others, it will be necessary in the first place to establish the fact that this has ever actually been accomplished, which has not been done up to the present time. On this subject I fear more importance has been attached to the process itself than to the facts in the case. In no case do I find that the wound definitively closes without any suppuration. M. Serre, (*Gaz. Méd.*, p. 825,) who in France zealously advocates primitive reünion, and who, to ensure it with more certainty, uses the suture after amputations, never, however, cures his patients under fifteen days. Now I have obtained results no less satisfactory, by the method I have pointed out for treating amputations in general.

[*Flap Operation in Amputations.*—Mr. Fergusson (*Pract. Surg.*) invariably recommends the flap operation of Lowdham, (claimed as one of *British* origin.) So also do Messrs. Liston, Lizars, and others educated in the Edinburgh School, Sir George Ballingall, equally favorable to it, does not concede all the advantages claimed for it, nor coincide in the censures cast upon the circular incisions. In the Edinburgh hospital alone, over 400 amputations by the flap method were performed he thinks, in the space of twelve years.

Rapidity of execution, and a far better and more fleshy and less cutaneous cushion to the stump, are two of the great advantages of the flap method. But the latter result may be obtained in the circular, by giving a slope to the incisions from the divided edges of the bone to the surface.

In thick muscular parts as at the deltoid and calf, the flap mode is objected to as giving too large a cushion; but whether by the circular or flap, this redundance disappears and the end of the bone is ultimately left in both cases with a similar covering, *i. e.*, condensed cellular tissue, which forms the best stump. Non-union, suppuration, exfoliation, protrusion of bone, tumors on the ends of the nerve, &c., are as common after the flap, as after the circular operation.

Sir George Ballingall, after his extensive experience, confesses that it is difficult to relinquish the flap operation after having once been in the habit of performing it, because it presents facilities so much greater than other processes. T.]

## § II.—*Amputation at the Knee.*

A. The disarticulation of the leg, though obscurely alluded to by Hippocrates (*De Articul.*, t. II., p. 381, edit. Vanderlinden) and Gny de Chauliac, (*Trad. de Joubert*, p. 464,) and more clearly specified by Fabricius de Hilden, (*Observat. Chirurg.*, p. 504,) did not, however, seriously attract attention until the last century. Notwithstanding the efforts of J. L. Petit, (*Malad. Chirurg.*, t. III., p. 20,) Hoin and Brasdor, who endeavored to bring it again into repute, it was recommended

by no one, and M. Blandin was almost the only person who had the courage to reproduce the arguments of Brasdor in favor of it; it was, in fact, an operation which at the first glance seemed destined to be proscribed from modern surgery, until I myself, in 1829, made the attempt to re-produce it into practice.

De la Rocque (Planque, *Biblioth.*, t. V., p. 12, in 4to.) informs us of the case of a young girl seventeen years of age, who was amputated at the knee, and recovered perfectly. In one of the cases mentioned by J. L. Petit, the amputation of the knee appears to have been had recourse to only because the instruments to perform it in the continuity were wanting. The other was a young man who had both bones of the leg in a state of exostosis and caries throughout their whole extent. There is every reason to believe that these two operations, of which J. L. Petit was a witness only, resulted in a perfect cure. A slater, who nineteen days before had fallen from a height of thirty-two feet, was received into the hospital of Dijon on the 26th of July, 1764. His leg was in a state of gangrene as high up as the knee. Hoin (*Mém. de l'Acad. Royale de Chir.*, t. V., p. 508, 1819) disarticulated the leg, and though there were not soft parts sufficient to allow of immediate reunion, the man ultimately got well. In the month of July, 1771, he was still living, could use his wooden leg with freedom, and ascended the scaffoldings and upon roofs as he had done before the accident. Gignoux, (*Ibid.*, p. 512,) of Valence, speaks of a young girl whose leg had been separated from the thigh by gangrene, and whose health for the last four years had been completely restored. Sabatier (*Méd. Opér.*, t. IV., p. 548., 1824) mentions having seen a boy in whom a ball had carried away the leg without wounding the patella, but without being followed by any unpleasant consequences. Dr. Smith, (*Journal des Progrès*, t. I., p. 240,) in the year 1824, disarticulated the leg in a young lady, who, ever since, has been enabled to walk by means of a wooden substitute. A serofulous patient was amputated in the same manner, in the year 1824, at the hospital of Saint Louis, by M. Richerand. A variety of accidents, such as purulent abscesses and collections, it is true, at first alarmed the surgeon, but the wound, nevertheless, ultimately cicatrized. M. Dezeimeris, in 1829, met, in the streets of Paris, with a male adult who had been amputated at the knee. This person could walk with ease, but by means of a cuish and without using his stump as a point d'appui on the artificial leg. M. Bourgeois has told me that he noticed a case in every respect similar, at Etampes. Rossi considers this operation as very simple, and says he has performed it twice with success; but the patient who was operated upon by M. Blandin, at the hospital Beaujon, died on the tenth day after the operation, in consequence of phlebitis.

B. *Appreciation.*—Thus have we 14 authentic cases of amputation at the knee joint, and of these, 13 cures; which, it cannot be denied, is for the first, a most encouraging result. Amputation in the continuity has certainly never furnished more satisfactory proportions. To those who would object that the amputation in the patients of Gignoux and Sabatier was performed as much by nature as by the surgeon; that gangrene had done part of the work in the cases mentioned by Hoin; that that of M. Blandin ultimately died; that all were young subjects, and could not use their stump for a long time; we may reply:—1, that if the wound

properly closed after the spontaneous fall of the limb, or after gangrene had already commenced the division of the tissues, there is no reason why it should be otherwise when the operation has been performed by art; 2, that the accidents to one of the patients came near falling a victim, do not belong to disarticulation more than to pure and simple amputation of the leg, and that his death, which occurred eight months after, was the result of his primary affection; 3, that we cannot see why adults should have less chances of success from this amputation than young persons; 4, that the length of the cure must be imputed to peculiar circumstances, and not to the character of the operation; 5, finally, that M. Smith had no complaint to make in respect to any of these inconveniences. But let us continue the exposition of facts.

In the month of January, 1830, I received into the Hospital of Saint-Antoine, an orphan boy, aged 19, who was addressed to me by M. Kappeler. The operation was fixed for the 14th of the same month. As there was not a sufficient quantity of soft parts remaining behind, I proposed to obtain a flap in front, of a certain length. The wound reunited but imperfectly. No accident happened, and though there still remained exposed a transverse surface an inch in width from before backwards, which the flaps would not cover, the cicatrix, nevertheless, was completed at the expiration of two months. This patient, whom I have often since seen, enjoys the most perfect health. The stump bears and transmits the weight of the body to his wooden limb with the same facility as if he had undergone only amputation in the continuity of the leg.

A man, 29 years of age, of good constitution, and born in the colonies, was sent to me at the Hospital of Saint-Antoine on the 24th of May following, by M. Thierry, who had been sent for to him for a comminuted fracture of the left leg. Gangrene soon made its appearance, followed shortly after by an ichorous suppuration, which becoming more and more copious, with pains excessively acute at the time of dressings, and even in their interval, and an almost continued febrile movement, with diarrhœa, &c., soon made me, on the other hand, entirely despair of saving the limb. I decided upon amputation at the knee, and performed it on the 4th of June. The febrile reaction made it necessary to bleed on the first and second day. No accident afterwards occurred up to the fifth; but on the sixth and seventh, a superficial erysipelas made its appearance, and reproduced the fever. In spite of this intercurrent phlegmasia, and of two small purulent patches, which formed at a later period at the angles of the condyles, and finally, of the consequences produced by deviations in regimen, causing, in fact, a real attack of indigestion, the cure was completed by the sixtieth day.

In the month of July, 1830, I had to examine, at the Bureau of Hospitals, a young man aged nineteen years, who had been amputated seven years before, and who came to ask for a new wooden leg. He told me that the operation had been performed upon him at the Hôpital des Enfants. The cicatrix was behind, and though the inner condyle, from being an inch longer than the other, could alone rest upon the artificial limb, he has, nevertheless, always been enabled to walk as well as if he had undergone amputation below the joint.

Since that period, the disarticulation of the leg has been performed



once with success, by M. Nivert of Azai-le-Rideau, on an adult man, who had his limb shattered by the discharge of a musket, M. Baudens, (*Bulletin de l'Académie Royale de Médecine*, t. I.,) has published an additional case; M. Chaumet has informed me of another successful one by M. Pichozel; and an American surgeon has related to me that he has performed it twice with a fortunate result. Some other practitioners have not had the same good fortune. A patient operated upon by M. Jobert, (*Plaies d'Armes-à-feu*, p. 293,) died in consequence of suppuration in the thigh. M. Laugier, who performed it twice, lost both his patients, and I have seen myself four fatal terminations. It is true that in all of them the amputation was performed under the most unfavorable circumstances. I am informed by M. Blandin, that the state of his patient scarcely allowed of the slightest hope, even before the operation. It was the same with two patients on whom I performed this operation at La Pitié, in 1831. The one old man, with gangrena senilis, died on the twenty-eighth day in consequence of the mortification having reappeared in the stump. The other, an extremely fat woman, with an enormous encephaloid cancer of the leg, which prevented me from preserving the integuments, except on the inner side, was attacked with an extensive suppuration throughout the body of the thigh, and with a large ulceration upon the sacrum; she died on the sixty-second day, without there ever having appeared, however, anything of a bad character in the wound itself. One of M. Laugier's patients had at the same time a comminuted fracture of the thigh; and one of those upon whom I have performed the operation at La Charité, a woman seventy-six years of age, died, exhausted in consequence of the long continuance of her sufferings. I should add, however, that my fourth patient, who was a man of 47 years of age, was strong and in favorable conditions. I fear, therefore, that I may have exaggerated the safety of this operation when I attempted to revive it in 1830, (*Archiv. Gén. de Méd.*, t. XXIV., p. 44.) It remains proved, however, that the objections which have been made against it have no solid foundation: 1, By exposing, it is said, large and cartilaginous surfaces, we incur the risk of formidable accidents. But this cartilaginous plate which invests the condyles, is a protecting covering, entirely destitute of sensibility, and which will remain for weeks entirely denuded, without the slightest inconvenience resulting from it. As the pretended synovial membrane, which Bichat has provided it with, does not exist, it is utterly impossible for this surface to become inflamed; 2, It produces an enormous wound, which it is next to impossible to cover by the surrounding soft parts. This is a mistake. This wound, so vast in appearance, is reduced, on a close examination, to a division of the integuments, and some fibrous layers and muscles. Provided the skin can be preserved to the extent of two or three inches, it is always quite sufficient to procure immediate reunion. 3, This wound is made on tissues which are not capable of becoming inflamed to the degree required, or which do not allow of a prompt and solid cicatrix, as in the fleshy part of the limbs. Persons are deceived on this point as well as on the other. Nothing is better than the cutaneous teguments; this alone is perfectly adequate to the formation of a good cicatrix. Let the whole synovial surface of the condyles be covered with it, and it will ag-

glutinate as well as upon the cut surface of a bone or large-sized muscles. 4. This operation being more painful and more difficult, is not followed by as rapid a cure as an ordinary amputation. This objection is not more solid than the preceding ones; as the facts above indicated sufficiently establish. 5. Another objection, and one which has been most insisted upon, is, that it leaves the patients after the cure in the same state as those who have had the thigh amputated, that is to say, that they are compelled to walk with a cuish instead of a wooden leg. I confess that this, for a long time, was an objection in my mind. But this is one, in fact, which it is not necessary to discuss at present, as the cases I have related are before us to determine its just value.

What then should be the reasons that ought to induce us to proscribe it? After amputation of the thigh, however low down we may perform it, the point d'appui, for the artificial substitute, can only be made upon the ischium. The motions of the haunch are almost completely abolished, and progression is made in the same way as if the coxo-femoral articulation was ankylosed. After disarticulation of the leg, however, the point d'appui is found at the extremity of the femur. The thigh preserves all its movements, and the patient is in the same condition as if he had a simple ankylosis of the knee. If it be true that, in respect to the functions of the limb, it is infinitely better to perform amputation of the leg in the continuity than to perform it upon the thigh, the advantages of disarticulation at the knee should equally be deemed to be placed beyond all dispute, because the weight of the body is transmitted to the artificial limb in the same way after this last operation as after the first. The wound in the one belongs almost entirely to the skin, and involves no bone and no aponeurosis; the surface to cover is convex, regular, destitute of every kind of roughness, and has nothing to fear from muscular retraction. In the other, on the contrary, the solution of continuity comprehends a vast enveloping aponeurosis and all its concentric laminæ, muscles without number and of considerable volume, a bone which is denuded with the greatest facility and whose section produces a concussion which is far from being always without danger, and, finally, the entire cellular tissue which unites all these various parts. In the knee, one artery alone of any considerable size is divided; torsion or compression controls this almost with as much certainty and ease as the ligature. At the thigh, besides the principal artery, we have a multitude of secondary branches, which all require to be tied with care.

If the amputation of the leg in the contiguity is dangerous, it is because of the large and deep synovial cul-de-sac which is prolonged upon the sides of the condyles, and upon the anterior surface of the femur. Purulent inflammation, if once established in this cavity, becomes almost as formidable as in a great articulation. Soon reacting upon the body of the thigh, it creates there a swelling, an erysipelatous blush, and a cakiness, which are not long in extending outwardly to the hip—ending in suppuration and abscesses, which pervade the whole extent of the muscular tissues. It was from these causes that three of my patients perished, as well as those of MM. Blandin, Jobert, and Laugier. The boy operated upon by M. Richerand experienced similar accidents; and when they make their appearance, there is real cause for serious apprehensions. If this cause of dangers could be abstracted, my first

opinion on amputation at the knee would remain correct. The disarticulation of the leg, therefore, without being a serious operation for the reasons put forth by the surgeons of the present time as by those of the last century, is, however, on the other hand, sufficiently so not to be undertaken when it is possible to amputate lower down.

[In the *New-York Journal of Medicine* &c. for November, 1852, Dr. Stephen Smith gives us the following general summary of the operation of amputation at the knee-joint. Of 86 cases, 37 died. Among the British surgeons who have most frequently performed this operation, may be mentioned Mr. Syme and Mr. Fergusson. The latter thus expresses his opinion of the operation, in the last (3d) Lond. edition of his *Practical Surgery*, p. 502 :

"There are many instances of incurable disease of the knee-joint where the serious mischief is limited to little more than the articular surfaces; in such cases, however great the surrounding swelling may be, as also in all examples where the whole of the leg must be sacrificed, whether for injury or disease, Mr. Syme proposes to substitute this operation for the proceedings hitherto performed higher up; and in several cases of the kind which he has published, and many occurring in my own practice, the results have been so satisfactory that I am disposed to consider the operation well worth the attention of the profession."

He has given a wood-cut of a stump made by this method, in 1845, which he thinks is equal to any he ever made in the thigh. This operation has been performed several times in this city, during a comparatively recent period, by Drs. Parker, Watson and others, but the former named gentleman does not speak of it in very favorable terms. G. C. B.]

*C. Operative Process.*—The patella, which J. L. Petit recommends should be removed, should always be preserved; the muscles raise it up, and soon fix it above the condyles, where it can neither interfere with the cicatrization, nor with the uses of the stump after the cure is completed.

*I. Process of Hoin.*—The process of Hoin, carefully described by Brasdor and the only one mentioned by French authors, and which consists in penetrating the joint below the patella from before backwards, in order to terminate by cutting a large flap at the expense of the calf, has more than one inconvenience. The anterior lip of the wound, drawn upon by the action of the muscles and the natural retractility of the tissues, often afterwards ascends above the cartilaginous surfaces. Its angles, now flaring open and pushed back by the lateral projection of the condyles, soon leave a portion of the bone denuded, in spite of all we can do. The flap, always thinner at its root than at its point, is badly adapted to the parts which it is intended to cover. The state of the tissues, also, sometimes renders it difficult to give it sufficient length to bring it with ease to the border of the retracted patella. Finally, it is rare in fact that the cicatrix is sufficiently high up to leave no room to apprehend some degree of pressure upon it in walking or standing.

*II. Process of Lèveillé.*—If we confine ourselves, after the manner of Lèveillé, (*Nouv. Doctrine Chir.*), to cutting a flap at the expense of the soft parts anteriorly, we can rarely give extent enough to it for the cicatrix to become sufficiently remote from the point d'appui of the con-



dyles. Moreover, this mode of operating has not been noticed in any work, except perhaps that of Monteggia, who barely alludes to it.

III. *Process of M. Blandin*.—Nor can I perceive what we should gain by commencing, instead of finishing, with the posterior flap; nor what good would result from making a precautionary counter-opening in the hollow of the ham for the passage of the ligatures and pus, as is proposed by M. Blandin.

IV. *Process of M. Smith*.—By cutting two flaps, as suggested by M. Smith, or rather by Bécclard, as I am informed by M. Belmas, who assisted at the operation upon the child mentioned farther back, we are not under the necessity of borrowing so much tissue from the calf. Compelled to adopt this process with my first patient, I acquired the conviction that it presents at least as many advantages as those of Petit, Hoin, and Brasdor. Whether, however, there be one flap or two, nothing can prevent their shrinking and retracting as they thicken, and consequently their leaving a greater or less considerable portion of the condyles entirely denuded; from whence it results that the cicatrix in this part can never be completed, except by a tissue of new formation.

V. *Process of Rossi*.—The method of Rossi, (*Méd. Opér.*, t. II., p. 227,) which consists in cutting one flap upon the inside and the other upon the outside, instead of in front and behind, though still more objectionable, is not, however, to be wholly rejected when the skin is much less altered upon the sides than any where else.

VI. *Ovalar Process*.—M. Baudens, (*Bull. de l'Acad. Roy. de Méd.*, t. I., p. 325,) by dividing the skin in front an inch lower down than behind, obtains a wound of an oval form, whose apex terminates in the ham. M. Sédillot, who arranges his oval in an inverse manner, is obliged to prolong its point towards the patella. In one case I was myself obliged to place the oval transversely; but these processes, though useful where the integuments are degenerated higher up in one direction than in another, are, as a general method, less suitable than the following.

VII. *New Process*.—a. In the process which I have adopted, the skin is divided *circularly*, at three or four fingers' breadth below the patella, and without involving the muscles. In dissecting it, to raise it up, or to reverse it outwardly, we must take care to preserve the celluloadipose layer, which lines its inner surface, and also not to strip it of its sanguineous capillaries. An assistant is immediately to seize hold of it, and draw it back to the knee, until the ligamentous patella having been divided, the instrument can strike upon the inter-articular line; the surgeon then divides the lateral ligaments, widens the osseous surfaces by making slight flexions with the leg, detaches the semilunar cartilages, completes the section of the crucial ligaments, traverses the joint, and terminates by dividing, with a single stroke of the knife, the vessels, nerves, and muscles of the ham perpendicularly to their track, and on a level with the raised-up integuments.

b. *Dressing*.—After having tied or twisted the popliteal artery, and the less important branches which may require it, the operator draws towards him all the skin that has been dissected, cleans it, and if his intention is to effect immediate re-union, approximates the lips in such manner that the angles of the wound may be placed transversely.

Upon the supposition that primitive union cannot be attempted, a perforated linen should be applied upon the whole of the wound, which should then be filled with small balls of lint, (see Vol. I.,) and these are to be covered with soft plumasseaux, (of lint,) and the whole supported by an ordinary containing bandage.

c. By this method the integuments represent a species of *purse*, or ruff, which envelop and cover the condyles as well upon the sides as in front and behind. As its mouth has a diameter somewhat less than its bottom, it is in the condition of a tight sleeve which one should attempt to slide up from the wrist towards the elbow, that is to say, that it has very little tendency to slip up towards the thigh. The muscles being divided square off at their root, where they are, very thin, can give place only to a very small bleeding surface, while they leave the skin free, and can no further aggravate the traumatic inflammation, or give apprehension of too abundant a suppuration, as in the other processes. Finally, the ligatures, if these are used, are applied with facility, assembled together at a point nearly approximated to the vessels they embrace, and in such manner as to irritate but to a very trifling extent the interior of the wound.

VIII. I do not wish to be understood, however, from these remarks, that all the other processes are henceforward to be discarded as useless. If the skin should be found to be too much altered in front and without, being so much so behind, we must rely on the method of Petit. The process of M. Smith, would to some extent, become a matter of necessity, if the degeneration proceeding higher up on the sides towards the condyles than on the anterior and posterior surfaces, had already traced out the limits of the flap to be formed. But in other cases, so often as circumstances admit of a choice, the circular method offers indisputable advantages, and deserves to have a general preference.

#### [AMPUTATION AT THE KNEE-JOINT.]

M. L. Blaquière (*Jour. des Connaiss.*, &c., Paris, Août, 1844, p. 60, &c.) states, that while in Mexico, in 1833, he amputated at the Hospital of Saint Juan de Rio de Oaxaca, the right leg at the femoro-tibial articulation, in an Indian, aged about 25, of the village of Tlacolula, in whom the whole leg, to within a few inches of the knee, had become sphacelated from hot bricks, used during the cold stage of, Asiatic cholera, then prevailing in that capital. M. Blaquière did not wait for the limitation of the gangrene, as the patient was in good condition, and without fever. He adopted the process of our author, M. Velpeau, and had every reason to be satisfied with it; for although the ruff of integuments intended as a flap to the condyles, also sloughed away, and the cartilaginous incrustation of the articulating surface of the condyles exfoliated, the surgeon, in another visit to Mexico, in 1843, found, on a visit from the patient, that the wound had perfectly healed, with a very small cicatrix, and that the limb had been made very serviceable by an apparatus which the patient had contrived. M. Blaquière is strongly in favor of disarticulations, wherever they can be performed, in preference to amputations in the continuity. He considers the accidents in the latter, from the masses of muscular and aponeurotic tissues and large

trunks that have to be divided, and which give in the thigh particularly so enormous a wound to the stump, as infinitely more dangerous. This disarticulation, has been practised in two instances with entire success by M. Murville, Surgeon in Chief of the Military Hospital of Lille, (*Gaz. Méd. de Paris*, November 31, 1845.) In one, an infant aged 20 months, whose leg was crushed by the wheel of a carriage on the middle portion of the limb, sphacelus supervened and extended to about a finger's breadth from the inner tuberosity of the tibia. The gangrene becoming limited, the leg was amputated in June, 1845, at the knee by a circular incision, preserving as much of the skin as possible in front, and of the tissues of the muscles posteriorly, the latter in order to fill up more perfectly the inter-condyloid notch. Union was effected by first intention by means of four sutures and some adhesive straps; and in order to prevent more effectually the admission of air into the suprapatellar synovial cul-de-sac, the lodgment of pus there, and infiltration of liquids into the cellular tissue of the popliteal space, two graduated compresses were applied, the one in front and the other behind the extremity of the stump. On the tenth day all the ligatures, including that on the popliteal artery, had come away, and the wound was perfectly cicatrized. Forty days after the operation a wooden leg was adapted to the stump, which latter was as excellent a one as could be desired. The amputated limb became perfectly developed, and the patient, at the time the case was drawn up, (by M. Ollagnier) could use it with astonishing facility.

In the other case, a man aged 48, the tibio-tarsal articulation was crushed by a block of wood, and from neglect to attend to the patient violent inflammation had ensued, involving the whole leg in gangrene; after reducing which by suitable means, and especially by four deep incisions in a direction with the axis of the limb, each from 5 to 9 inches long, and two of which were in the anterior and two in the posterior tissues, besides dividing the aponeuroses transversely to their fibres, the gangrene was in this manner by the sanguineous depletion and the elimination of the purulent collections, finally localized and limited.

The mortification having extended as in the other case to within a finger's breadth of the anterior spine of the tibia, it was concluded to amputate at the joint, and not to defer it any longer for fear of purulent absorption. The operation was performed 16 days after the accident by the flap method,—one incision which was circular and in front, and two fingers' breadth below the patella, being extended from the lateral internal to the lateral external part of the knee, while the other incision was made posteriorly so as to procure a thick flap in the tissues in that direction. Ten ligatures were used, including that on the popliteal artery; the wound was united by six sutures and adhesive straps, with graduated compresses as in the other case, one above the patella, the other on the inter-condyloid space. The operation was accomplished in 30 seconds. Sixty-two days after the operation an excellent linear cicatrix was formed, situated transverse to and at the apex of the stump, which latter it divided into two parts, one anterior and rather small, in which was comprised the patella strongly retracted and slightly movable at its inferior portion; the other posterior in which was included the most projecting point of the condyles. On this latter portion fell the



pressure of the wooden leg, which he continued to use up to the last date (Oct. 10, 1845) with as much ease as if he had been operated upon at the place of election.

Mr. Syme *strongly urges amputation at the knee-joint*, in other words, disarticulation of the leg at its tibio-erural extremity, or amputation immediately on the *condyles of the femur*, close above the line of the articulating surfaces, in every case where it can possibly be done in lieu of the prevailing modes of sawing through the shaft of the thigh bone, at its middle portions. The next best place of division above, when it cannot be done at the knee or condyles, he considers to be the *trochanters*. All this practice he claims to himself the merit, in some measure, of having first endeavored to generalize and render popular, (Cormack's *Lond. & Edinb. Monthly Journal of Medical Science*, May, 1845, p. 338, et seq.,) as he had previously enforced (*Ib.*) a similar practice in regard to the preference to be given to *disarticulation of the ankle-joint*, if it is possible to avoid section of the bones of the leg. Mr. Syme says the stern evidence of hospital statistics still shows the average of deaths not less than 50 to 70 per cent. in *amputations of the thigh, i. e.*, in the continuity, together with the frequent annoyance in many of the survivors, of a *protrusion of bone, accompanied sometimes with those tubular or conical exfoliations*, as they may be called, which he has seen extending into the interior of the femur for several inches, and which have to be extracted from the stump. Diseases of the knee-joint, as caries, and compound fractures of the leg and thigh, and tumors growing from the bones of the leg and thigh, are the cases which most frequently demand, especially the former, the process recommended by Mr. Syme. Diseases of the knee-joint, however great the serofulous degeneration and suppuration, may be effectually cured, the Professor of Edinburgh says, by sawing through the condyles a few lines above the articulating surfaces, as is proved by his successes in these operations, and in his excisions of the elbow-joint, (See *supra*, in Vol. I. of this Amer. edit. of Velpeau,) and amputations at the ankle. For the same reasons, in compound fractures of the leg, where the muscles or integuments of the thigh would admit of amputation at its middle or lower third, we ought to give the preference to the section at the condyles. So also, similar injuries of the thigh obviously require amputation at the trochanters. These modes, he believes, would be eminently successful, and we are encouraged so to think, he says, from the fact that out of *twelve cases* of amputation at the ankle-joint, in his own practice, and as *many more* in that of other practitioners, who have been induced to adopt it, this operation (at the ankle-joint) *has not in a single instance*, been followed by either the death of the patient, or exfoliation of the bone—even in cases where he would have declined amputating the leg as altogether desperate.

A modification of *amputation at the knee-joint immediately above the condyles*, so warmly insisted upon by Mr. Syme, has been proposed and found to answer excellently well by Mr. Fergusson, at King's College Hospital, London. In a case aged 24, where the left knee-joint had been for a length of time enlarged, with abscess and more or less pain on moving the joint, Mr. Fergusson made a transverse incision in front above the apex of the patella, then plunged his knife transversely

in front of the ham-strings, cutting out a long thick flap from the calf, which, after dividing the femur close above the condyles and patella was brought up into neat coaptation in front, healing nearly all by first intention, and forming a capital stump. The surgeon of London was led to this modification after having made up his mind to give Mr. Syme's favorite place for amputateing the femur below, a fair trial. It certainly strikes us as one that will prove useful in such cases. Difficulties were found, however, in securing the popliteal artery from the morbid alteration and condensed hard character of the tissues around it. Mr. Fergusson considers Mr. Syme's arguments, (which we have stated in the text,) in favor of this amputation as evidently well founded, to wit, the less danger of inflammation and necrosis in the spongy condyles, than in the solid shaft, and also avoidance of the danger of dividing through the joint itself. It is become an axiom also, as Mr. Fergusson says, to exsect no more than necessary, as is seen (See our notes) in scooping and trephining out the carious part only of joints, small bones, shafts of long bones, *i. e.*, what is degenerated, and no other portions in other words, *pro hac vice*, and no mode, (See *London Lancet*, July, 1845, p. 79.) T.]

[The following note to Dr. Simpson's *Statistics in Surgery*, published in the *Edinburgh Monthly Journal*, Nov, 1847, p. 322, is worthy of record in this place

"In the first observations which Mr. Syme published on amputation, (*Ed. Med. and Surg. Journal*, Vol. XXI., p. 31,) he strongly maintained that 'the circular mode of amputation is in every point of view bad;' and, writing in 1842, he still held that 'amputation of the thigh ought always to be performed by making flaps.' (*Principles of Surgery*, p. 156). In 1845, Mr. Syme believing, from statistical evidence, 'that there is something radically wrong in the principle' of amputation of the thigh, both by the flap and circular methods, proposed in their stead amputation of the knee; and thus dividing the thigh bone through its condyles, instead of through its shaft.—(See *Month. Journ.* May, 1845, p. 337). In the same *Journal* for November, 1846, (p. 225) he does 'not persist in advocating amputation at the knee,' but avows himself now satisfied that the old circular method of amputation may be 'employed at the lower third of the thigh safely and advantageously,' and should be preferred to the flap operation at a higher part of the limb, when the circumstances afford room for choice." G. C. B.]

#### ARTICLE VIII.—AMPUTATION OF THE THIGH.

##### § I.—*In the Continuity.*

A. In the thigh, quite differently from what we do in the leg, we always amputate as low down as possible. The more length the stump has the easier it is to apply artificial limbs. The operation in itself one of the most dangerous, is so much the more so the nearer we go to the trunk. M. Langenbeck has recommended never to perform it at less than six fingers' breadth above the knee, alleging that lower down the artery is found imprisoned, as it were, in the sheath furnished to it by the adductor muscles, and from which it would be difficult to draw it

out in order to apply the ligature. But whether the femoral artery be cut above or below the fibrous canal it traverses, or in the canal itself, there cannot in any case be any very great difficulty in seizing it, and no use certainly in dividing its sheath afterwards. As it is rare, on the other hand, that the disease allows of our making the incision of the integuments at less than two or three inches above the patella, the result is that the section of the femur is almost always made at more than five inches above the articulation, and that the precept of M. Lagenbeck therefore is superfluous. [By the note above it will be perceived, that so far from approximation to the trunk being deemed by some practitioners the measure of danger for the femur, Mr. Syme of Edinburgh will scarcely any longer hear of an amputation on this bone except at one extreme or the other, to wit, at the trochanters or the condyles, and never in the shaft. T.]

B. *Anatomy*.—As in the arm, we find in the thigh two layers of muscles; one superficial, composed of the rectus femoris, the sartorius, the gracilis, the semi-tendinosus, and semi-membranosus, and the long portion of the biceps flexor curis; the other layer deep seated and comprising the three portions of the triceps and the adductors. The first reaching from the pelvis to the leg, and each having in some sort a distinct cellular sheath which enables them to glide over each other easily, necessarily possess a very great degree of retractility, and to a greater extent the lower down we make their division; the intimate union of the others on the contrary to the bone prevents their having more than a very limited power of retraction; from whence it is that it is the superficial layer of muscles only, which after amputation sometimes leave by their retraction the femur uncovered, and thus gives rise to its protrusion. Near the pelvis we have, moreover, the psoas muscles and the iliacus internus, the glutæus maximus, the pectineus; then very high up the glutæus medius and glutæus minimus, the obturators, the gemelli, the pyramidalis, and the quadratus femoris, which by the distance from their point of origin, would tend much more to enlarge the wound than to denude the bone, if the amputation should be performed between the little trochanter and the hip [joint.]

The femur being a little curved forwards at its middle part, is covered in front by a thinner tissue of soft parts and by muscles much less retractile than it is behind. From whence it happens, that in amputations of the thigh the cicatrix almost constantly inclines a little more or a little less backwards and inwards, and that the extremity of the bone scarcely ever corresponds with the centre of the stump. The crest which the bone presents on its posterior part, constituting the termination of a cylinder of sufficient regularity, easily splinters under the action of the saw, and is a point, therefore, that we should be on our guard against during the operation.

The femoral artery is the only important trunk we meet inferiorly. Being hidden behind the sartorius it is always easy to find. The great anastomotic, however, is not to be forgotten. As it is sometimes enveloped in the fibres of the third adductor, whose direction it takes, it is in certain cases very difficult to isolate. The profunda and the perforating arteries, and nearer still to the pelvis, the superficial muscular artery and the circumflex arteries, must be added to the femoral; the first on



the front of the adductor muscles or in their substance; the second, under the rectus femoris; the two others on the inside and outside a little above the small trochanter.

The femoral vein is so closely connected with the artery that the pressure upon the latter prevents the blood ascending in the former, and thus frequently becomes the cause of hemorrhage. The great sciatic nerve, free at the posterior part of the thigh in front of the superficial muscles, and destitute in itself of the least retractility, is found sometimes pendulous at the bottom of the wound, beyond the level of which it may project for more than an inch, making the dressings exceedingly painful. The best thing then to be done would be, as advised by Descot, (*Affect. Locales des Nerfs*, 1825,) to divide it immediately. Another nervous branch which also requires some attention is that which accompanies the crural artery. Its small size prevents it from being readily distinguished. Taking care, however, to recollect that it is always on the inner and anterior side of the artery or vein, there will not be much difficulty in finding it and pushing it aside. Inasmuch as it is quite possible that much of the pain of which persons amputated complain, in assigning it to the limb they have lost, may be caused by the ligature embracing certain nerves, it is necessary to avoid these cords with care while tying the arteries.

B. *Operative Process*.—I. *Circular Method*.—All that has been said of circular amputation in general, specially applies to the thigh. Of all the amputations in the continuity, this being the one that is the most serious and dangerous, is that which has particularly interested the attention of Fabricius of Hilden, Wiseman, Pigray, J. L. Petit, Le Dran, Louis, Pouteau, Valentin, Alanson, Hey, Desault, &c., in their treatises on removal of the limbs.

a. *First Stage*.—The patient being placed at the foot, or on the edge of the bed, or on a table, and his thigh left free up to its root, is supported by four or five assistants, one for the head and arms, another for the pelvis, a third for the sound limb, a fourth for the limb on the diseased side, and a fifth to raise up the tissues.

The tourniquet, or the garrot which some still use at the present day, and all kinds of bandages that were formerly in use above the point where the tissues are to be divided, in order to prevent hemorrhage, would prevent or, at least, interfere too much with the retraction of the muscles, and should be dispensed with. The practice of Louis and Bordenave, (*Mém. de l'Acad. Roy. de Chir.*, t. V., p. 59—60, in 4to,) adopted by almost all the moderns, and which consists in making pressure upon the artery on the body of the pubis, as it relieves us from this inconvenience, deserves the preference which is generally accorded to it. Noel, (*Réponse aux Quest. proposées par la Com. de Santé*, p. 24,) whom the commission of health asked which it was, the garrot or the tourniquet, that was employed in the army, replied:—"There is no longer any more talk in our army of the tourniquet and garrot, than of a Jubilee to the Jacobins of Paris." A pelote, pressed by an assistant against the femoral artery at its egress from the lower belly, for amputations of the lower extremities, or applied with force under the armpit for those of the upper extremities, is advantageously substituted for those two pernicious instruments which have been the subject of as fierce

disputes, he says, as the treaty of grace. The surgeon, unless under peculiar circumstances, would not be excusable in following the ancient method except there should be a deficiency of intelligent assistants. The inguinal bandage, devised by Pipelet (see *Atlas de l'Encyclop. Méth.*) at the suggestion of Louis, is also useless. Siegen, observing that the tourniquet was displaced in a patient that Boon (Richter, *Biblioth Chir.*, t. X., p. 462) amputated, placed his fingers in the groin, and arrested the hemorrhage, so that Boon, who otherwise preferred the tourniquet to benumb the limb, already advises, at this epoch, to make pressure in the groin with the fingers upon a bandage rolled in the form of a pelote. In every case the tourniquet was to be placed as high as possible. In order that the root of the limb may always be embraced with the left hand, it is the practice in England for the surgeon to place himself always upon the right side of his patient, so that in amputation of the left thigh, the sound limb is interposed between the operator and the limb to be removed. There is no occasion for my criticising a rule like this, as every person among us will give it the name it merits. In France, the surgeon places himself on the outside for both limbs, which puts him under the necessity, for the left limb only, of consigning to the assistant the entire duty of raising up the integuments and muscular tissues.

*b. Second Stage.*—The first stroke of the knife, which ought to comprise, as far as possible, the whole thickness of the integuments, is made, in the first place, above the knee at four or five fingers' breadth from the point where the section of the bone is to be performed. Whether we reach or not the aponeurosis and subjacent muscular fibres, is a matter of no consequence; the important point is, that the skin shall have been completely divided. In order to favor its retraction, while the left hand of the operator or that of an assistant draws it back, it is important to recollect, that in front of the borders of the ham, it adheres more closely to the aponeurosis than anywhere else, and that, in this place, it is usually attached to the bottom of the supracondyloid grooves.

*c. Third Stage.*—The knife being reapplied on a line with the retracted integuments, divides the muscles, if not down to the bone, at least through the superficial layer. After having drawn back this first layer, the surgeon applies the instrument upon the base of the cone which is formed by it; divides, with a third stroke of the knife, the remaining fleshy fibres; lays bare the femur; applies the split compress, crosses its two tails in front; divides the few tissues which may be still adherent to the osseous portion which he is about to remove, and saws immediately through the bone at five full fingers' breadth above the first incision. M. Van Onsenort, who places himself on the outside of the patient, divides, with the first incision, the skin and all the soft parts on the inner and posterior side of the thigh down to the bone. While the divided muscles are contracting, he completes the section on the outer and anterior side, and terminates the operation by taking care to cut on a line with the extremities of the contracted muscles. I have followed this process without having any reason either to complain of or to applaud it.

Above the middle part of the thigh, the muscles retract much less;

but as the volume of the limb is more considerable, we must here also commence at four inches below where the section of the bone is to be made. Nearer still to the hip, perhaps there would be some advantage in making use of M. Graefe's buckler knife, in order to form a funnel out of the soft parts, or we might divide them as Alanson or Dupuytren does by inclining the blade of the instrument upwards. In fact, their section perpendicularly makes almost a square-shaped wound, whose borders it is sometimes very difficult to bring into contact. Also, it is an inconvenience which may easily be avoided by taking the precaution to dissect the skin to the extent of two inches, and of reversing it back upon its outer surface, in place of confining ourselves to the division of the cellulous bridges which unite it to the aponeurosis, as in the process of Desault. I have seen M. J. Cloquet unable to effect immediate reunion, in consequence of having neglected this precaution at the Hospital of Perfectionnement, in the case of a young man in whom he had been compelled to amputate the thigh at a short distance from the great trochanter; and the same thing has happened to me from not having been enabled to observe this rule in a similar case.

*d. Fourth Stage.*—The arteries that are to be tied or twisted are the femoral, the great anastomotie, and some branches of the articular arteries, or of the last perforating artery below. Their number increases the higher up we go; so that above we have, moreover, the profunda, the superficial muscular arteries, and some branches of the circumflex arteries, and of the obturator and ischiatic. With the view of facilitating the discharges, the French surgeons give such direction to the wound, that one of its angles looks forwards, while the other is turned directly backwards. Some practitioners of Great Britain censure this mode, because, say they, the posterior angle of the wound must necessarily in this manner, press upon the cushion or mattress. Hennen, among others, recommends that the tissues should be approximated from before backwards, and a transverse direction be given to the wound. But, without being absolutely essential, the French method is evidently the best. In respect to the position of the stump after the dressing, I have only to refer to what I have said on this subject farther back. I will only remark that it is difficult to give to its wound an inclined position. For it would be necessary for that purpose when the patient is in bed, to make a degree of extension which might be injurious, and which the natural action of the psoas and iliac muscles would render very fatiguing, if not impossible. Instead of a thick cushion, therefore, I place under the end of the stump only a simple folded alêze, (folded linen, see Vol. I.,) with the expectation, also, that the inferior angle of the wound will occupy a more favorable position.

If the torsion of the arteries, which I have sometimes adopted, or the suture which I have made trial of but in one case, would procure a reunion without suppuration, they ought to be resorted to; but this result has not yet been proved up to the present time. A child has been cured, it is said, in eight days. In a patient of M. Serre, (*Gaz. Méd. de Paris*, 1836, p. 826,) nothing remained on the tenth day but a *few points* in a state of suppuration. All this, however, does not furnish conclusive evidence. The cure of one of my patients, treated by simple approximation, was effected on the twenty-second day; others were almost entire-



ly restored on the sixth, eighth or tenth day ; notwithstanding which, the greatest number were not entirely well until at the expiration of a month or two !

II. *Flap Method*.—Inasmuch as circular amputation, by the modern processes, when properly performed, generally admits of the lips of the wound being brought together with facility, and of immediate reunion, it has not been thought necessary to make as varied trials of the flap method above as below the knee. Notwithstanding the advantages that Ravaton, Vermale, Le Dran and Desault say they have derived from it, and the successes that Paroisse had from it on the field of battle, and although the seven cases that Klein speaks of were almost entirely restored in the space of ten days, and that M. V. Mott and many other surgeons, German as well as English, have also made trial of it with advantage in these latter times, it is, notwithstanding, but very seldom employed. An objection made to it is, that it is more painful and tedious, which, however, is far from being demonstrated ; also, that it requires a greater extent of sound parts, which assertion, as it appears to me, has some little more foundation ; and that it exposes to more serious general accidents which, perhaps, so far as this last point is concerned, may also be somewhat true. I tried it but once ; the bone escaped from the upper angle of the wound, and the patient died. Some surgeons, as M. Guthrie for example, who, moreover, prefer the circular method, nevertheless have recourse to the flap process where it becomes necessary to amputate the thigh at its upper third ; it offers, in such cases, unquestionable facilities for the approximation of the lips of the wound.

[Mr. Guthrie in such cases gives the preference to the flap operation as modified by Mr. Luke of the London Hospital. The patient being so placed that the thigh projects beyond the table, the surgeon stands with his left hand towards the body, or on the outside, when amputating the right, and on the inside, when amputating the left thigh. The knife to be used ought to be narrow, pointed, and longer by two or three inches, than the diameter of the thigh at the place of amputation. The point of the knife should be entered mid-distance between the anterior and posterior surfaces of the thigh, which may be effected with accuracy if the eye is brought to a level with the thigh, when the middle point is easily determined. The posterior flap is to be formed first, by carrying the knife transversely through the thigh, so that its point shall come out on the opposite side, exactly midway between the anterior and posterior surfaces. In traversing the thigh, the knife should pass behind the bone, and will be more or less remote from it in different individuals, according to the greater or less development of the posterior muscles, when by cutting obliquely downwards, to the extent of from four to six inches, according to the thickness of the thigh, a posterior flap is formed. The anterior flap is effected, not by making a flap, but by commencing an incision through the integuments and muscles on the opposite side of the thigh to the surgeon, and at a little distance anterior to the extremity of the posterior flap. This incision is made from without inwards, through the integuments, so as to form an even curve, and without angular irregularity, over the thigh, to near the base of the posterior flap on the side on which the surgeon stands. The length of

this flap is determined by that of the posterior. It will therefore vary from four to six inches, as before stated; and for its completion, will require a second or perhaps a third application of the knife. In the two flaps thus made, the division of almost all the soft structures is included, a few only, immediately surrounding the bone remaining uncut. These are to be divided by a circular sweep of the knife, at the part where it is intended to saw the bone; and in this way it is sufficiently denuded for the application of the saw. The flaps being held back, the bone is to be sawn through in the usual way. If the ischiatic nerve lies upon the surface of the posterior flap, it should be removed. The *whole surfaces* as well as the edges of the flaps, must be kept in accurate contact by means of compresses, adhesive plaster, and sutures. In the great majority of amputations thus treated, it is claimed that primary union has been secured, *non-union of the flaps* being the exception,—union, the rule.

Mr. Luke's amputation of the leg differs from that of the thigh in some particulars. There is a greater variety in the proportion which the soft parts in the posterior flap, bear to those in the anterior: and the distance from the bones at which the limb is transfixed in the first step of the operation is subject to such variety, that in the large calf the mid-point for the introduction of the knife lies at some distance from the posterior aspect of the bones; in the small calf it is close to it. The course of the knife through the limb is oblique, instead of transverse, for the purpose of accommodating the line of incision to the plane of the two bones. The anterior flap has proportionately more integuments and is thinner than in the operation on the thigh, yet its base and length are rendered equal to the base and length of the posterior flap, and may be adjusted evenly with it when the stump is dressed (*Guthrie's Commentaries in Surgery*, pp. 83, 97).

Mr. Skey states in his *Operative Surgery*, Lond. Ed. p. 323, that Messrs. Lawrence and Stanley, have almost abandoned the flap operation, as did the late Mr. Bransby Cooper. He himself gives the preference to the circular. There can be no doubt that it may be performed with the greatest rapidity, and Mr. Skey remarks that he has by this method amputated the thigh "within half a minute." In December, 1853, we removed a thigh, by the flap amputation, in twenty seconds, and we have heard that it has been done in fifteen seconds! Mr. Ferguson and Mr. Erichsen give a decided preference to the flap amputation particularly in the middle and upper third of the thigh. G. C. B.]

*a. Process of Vermale.*—Nothing at the present time would induce any one to employ the 3 incisions of Ravaton, to obtain the flaps that we may require. It is infinitely more simple to plunge the knife at first through the thickness of the limb, as has been recommended by Vermale. The patient and the assistants being arranged as has been already described, the operator places himself outside for the right limb, and inside for the left, which position, however, could in a case of necessity be reversed; he then grasps the muscles with his left hand and draws them more or less from the bone, plunges in a long knife, so that it may fall upon the anterior surface of the femur at some lines below the point where he wishes to make the section; he now slightly inclines the point of his instrument so that it may graze the outer side of the bone; and

immediately after directs it in such manner that it may come out from behind at the point diametrically opposite to that at which it entered ; he then cuts from above downwards, and from within outwards, in order to form his outer flap, to which he gives a length of from three to four fingers breadth, and which an assistant immediately raises up. The knife being brought back to the anterior angle of the wound, pushes aside the tissues on the side of the axis of the body, glides upon the inner surface of the femur, reaches behind the bone, and in order not to cut the soft parts posteriorly a second time, the surgeon crowds them back and separates them towards the inside ; he in this manner cuts out a second flap of the same form and of the same length as the first.

If we should adopt the ideas of Hennen, and wished to give a transverse direction to the wound, the flap method would in no way interfere with it ; in that case all that would be necessary would be to place one of these flaps behind and the other in front, instead of making them on the inside and outside of the limb. I should prefer commencing with the outer flap, for the reason that from there being less of soft parts there, it is important to draw them to that part as much as possible, in order that there may not be too great a difference in the thickness of the two halves of the wound, and especially because we could in this manner dispense, if necessary, with compressing the artery at the inguinal space, since it is not divided until at the moment when we are terminating the flap.

*b. Process of M. Langenbeck.*—In place of cutting out the flaps by puncture from the deep-seated parts to the skin, M. Langenbeck divides the tissues from the integuments to the bone. He places himself on the inside for the right limb, and on the outside for the left limb, unless he makes use of his left hand ; he then causes the skin to be drawn forcibly back by an assistant ; seizes himself the knee with one hand, and with a knife of medium length cuts with a single stroke all the soft parts which cover the inner side of the femur, from below upwards and from the superficial parts to the deep-seated, in such manner in fine that his instrument arrives upon the bone only, at three inches above the point where he has begun his incisions upon the integuments. An assistant raises up this flap. The operator now directs his fore-arm behind, then outside, and then in front of the thigh, and cuts upon the outside a flap similar to the first, taking care that the extremities of the half moon that it forms shall coincide with the angles at the base of the inner flap.

*c.* In both these processes it will be necessary, after having raised up the two flaps, to apply the instrument near their root, in order to detach any remaining soft parts that may be still adherent to the bone, and to be enabled to apply the saw a little higher up on the bone than where the point of the instrument first struck.

It is evident also that we could get along very well with a single flap, either on the inside or outside, in front or behind, if the state of the parts were such as not to allow of our cutting a second one in the opposite direction ; and that all the details of the flap amputation in general are precisely applicable to that of the thigh in particular. M. Bancel, (*Thèse, Strasbourg, 1806,*) who says he has followed in every point the process of Vermale, declares that he has performed it suc-



cessfully more than sixty times. M. Hello, (*Thèse citée*,) who, after the example of M. Fouilloy and that of M. Plantade, (*Thèse*, Montpellier, 1805,) had recommended it before them, restricts himself to a single flap cut at the expense of the soft parts anteriorly, and maintains with reason that his process has the advantage over all others of making the most effectual resistance to the sally of the bone, inasmuch as the fleshy masses are drawn by their own weight upon the whole extent of the wound. I doubt, however, if the circular method properly performed is not still preferable to all those modifications which ought not to be retained, as it appears to me, but for cases that are exceptions. If I employed it, I should cut out a larger anterior flap and a smaller posterior one, instead of obtaining them on the side, and would thus deprive the bone of the power of protruding through one of the angles of the wound. If the disease should render it necessary to make the section of the bone on a line with or very near the trochanters, as in the patient of Knox, (*Edinb. Med. & Phys. Jour.*, Vol. XVIII.,) or that of M. Devey, (*Thèse de Paris*,) and as I have myself twice done, the flap method might have its advantages; but then it is a matter of less importance whether the flaps should be made in one way rather than another, as it is the condition of the soft parts which would be the surgeon's guide.

C. At the thigh the stump requires *subsequent cares*, which surgeons perhaps do not sufficiently attend to. In many cases nothing more is done than to place a cotton cap upon it; others cover it with compresses or flannel. M. Thomas, (de Revigny,) in order to keep the flesh under the end of the bone, has contrived a sort of blowse of linen, which answers its purpose sufficiently well. He moreover arranges at the bottom of the cuish, under the cushion which is to support to a greater or less extent the stump, a sort of wadded spring, which he much extols, and has very often applied to the drum-stick of numbers of persons for a long period back amputated by him at different places.

This spring which had already been used to raise up the heel in shortening of the leg, and of which M. Champion has transmitted me a pattern, would answer equally well for the supplemental bootkins [or buskins] for the foot.

[*Modification of the Circular Operation in Amputation in the Continuity of the Thigh.*—M. Le Sauvage, of Caen, (Sitting of the Academy of Medicine, Paris, March 22, 1842; *Journ. des Conn.*, &c., of Paris, Mai, 1842, p. 215–216,) has proposed a modification of the circular operation in amputation of the thigh, which appears to us to be very judicious, and one that it is truly surprising has not suggested itself before. It consists in the mode of making the section of the bone. After having drawn the soft parts as far back as can be done by the split compress, in order to denude the bone as much as possible, he directs his saw in such manner as to give an *ovalar surface* to the end of the bone, looking obliquely forwards. By this means, we avoid the irritation of the sharp angles of the straight transverse section, and the void they necessarily make; and the special advantages we obtain are the better adaptation and more ready adhesion (without suppuration) of the middle of the triceps muscle and the other soft tissues to this large smoother surface of the end of the femur; whereby there is less danger afterwards of protrusion of this extremity from the stump, and of rupture of the cicatrix. T.]

§ II.—*In the Contiguity.*

A. *History*.—Morand (*Opusculs de Chir.*, t. I., p. 176) appears to have been the first who entertained the idea of amputating the thigh at the joint, and conceived the possibility and success of this formidable operation. Two young surgeons, Wholher and Puthod, (Morand, *Opusc.*, &c., p. 176,) who had been his pupils, made a formal proposal of this kind to the Academy of Surgery, on the 3d of March, 1739, and obtained, on the 26th July, 1740, a favorable report from Le Dran and Guérin the younger. Ravaton (*Chir. d'Arm.*, p. 323–26) would have performed it in 1743, if his brother surgeons, called in consultation with him, had not been opposed to it. On the 7th of March, 1748, Theroulde sustained a thesis of Labourette on this subject, and which theme Morand succeeded in getting submitted to the *Concours* for the year 1756, and again, in 1759, the Academy not having on the first occasion found any memoir worthy of the prize they had proposed. They received thirty-four memoirs, and gave the prize to that of Barbet. Goursault, Moublet, (*Journal de Vandermonde*, t. II., p. 240, etc.) Lefebvre, Puy, and Lecomte, also, each published a treatise on disarticulation of the thigh. Almost all of them agreed that it was practicable—some from trials made on the dead body, others from experiments on dogs; while Barbet (*Acad. Roy. de Chir.*, t. IV., p. 1) reasoned thus, from analogy and from the fact that a child of fourteen years, attacked with gangrene from ergoted rye, and who had been amputated in this manner by Lacroix of Orleans, in presence of Leblanc, first on the right and four days after on the left thigh, appeared to be on the point of recovering, and did not die until fifteen days after the first operation.

Perault of Saint-Maure, in Touraine felt obliged to imitate Lacroix, in 1774, upon a patient named Gois, who had the thigh crushed between a wall and the tongue of a carriage, and afterwards destroyed nearly as high up as the hip by the progress of gangrene. This patient, whose history is given by Sabatier, (*Méd. Opérat.*, t. IV., p. 542,) recovered, and was for a long time a cook at an inn at Sainte-Maure, where I saw his son in 1815. Kerr, according to M. S. Cooper, (*Dict. de Chir.*, etc. p. 85,) performed the same operation nearly about the same time, on a young girl aged fourteen years. Perhaps the case ascribed to R. H. Toll, by Sprengel, (*Histoire de la Méd.*, t. VII., p. 331.) is the same as that of Kerr. M. Delaunay (*Bull. de la Fac. de Méd.*, t. VI., p. 197) states that he saw the case of a man at Moscow, whose thigh was disarticulated by gangrene, and who got well.

Pott and Callisen having severely censured this operation, and Bilguer, Tissot, &c., in vain defended it, there was scarcely longer any mention made of it in England and Germany, at the beginning of the present century. It was in the French armies, however, that it was put sufficiently to the test. A. Blandin gives three examples of it. He performed the operation on the first of these cases, in the month of Fructidor, an III., and effected a perfect cure. The second was also saved, and the third did not die until on the fifty-eighth day. M. Perret, another military surgeon, had the good fortune, about the same time, also to succeed in a case. So also Mulder, in 1798, on the

case of the girl named Wiertz, aged eighteen years; while Rossi says he saw (*Clin. Chir.*, t. III., p. 616) a case that recovered after spontaneous disarticulation. At the year 1803, M. Larrey had already several times disarticulated the thigh, and his memoirs relate two well-ascertained successes: one on a Russian at Witepsk, and the other on a French soldier at Mojaïsk. According to M. Gouraud, Dr. Millengen had two similar successes, and had published them at London. M. Baffos (*Bull. de la Fac. de Méd.*, t. III., p. 71-112) was the first who performed extirpation of the thigh at Paris, which was in 1812, at the Hôpital des Enfants, on a child aged seven years, who recovered from the operation, though the cotyloid cavity was diseased, but died from the progress of the scrofulous affection at the expiration of three months. A soldier wounded at Merida and operated upon by M. Brownrigg, in 1812, recovered so perfectly that he returned to reside in England, where many persons have since seen him, (*The Cyclopædia of Practical Surg.*, p. 182.) M. Guthrie succeeded in the same operation upon a French prisoner, whom M. Larrey exhibited in 1815, (*Bull. de la Fac. de Méd.*, t. V., p. 510,) and is now at the Invalides. Another successful case in France was that of Delpech, (*Arch. Gén. de Méd.*, t. XVII., p. 301;) a third and afterwards a fourth, in England, viz., by M. A. Cooper in the year 1824, and by M. Orthon in 1826. M. Mott, (*Philad. Journ. Med. & Phys. Sc.*, vol. XIV., p. 101,) in 1827, published a fifth case, and M. Wedemeyer (*Bull. de Férussac*, t. II., p. 165) a sixth. The patient of M. Syme (*Ibid.*, t. IV., p. 143) was cured by the thirty-fourth day. The one that M. Brice operated upon in 1825, and who came near perishing from hemorrhage, was seen by this surgeon, some months after, at Poros, in perfect health, as was also that of M. Hysern, seen by him, three years after, at Barcelona. M. Mayor's case (*The Cyclop. of Pract. Surg.*, etc., p. 182) also recovered. A soldier, who had been operated upon in Africa, had been a long time cured when he was exhibited, by M. Baudens, (*Bull. de l'Acad.*, etc., t. I., p. 324,) to the Academy of Medicine.

B. *Appreciation.*—At the present day this operation which, less than fifteen years ago, M. Richerand scarcely admitted to be practicable, counts more than twenty perfectly authentic cases of success. But how often has death also been the result! MM. Thomson, Kerr, A. Blandin, A. Cooper, Brooke, Colc, Walther, (*Journ. de Chir.*, t. VI. p. 1,) Larrey, Guthrie, Emery, Dupuytren, Blicke, Krimer, (*Bulletin de Férussac*, t. XVIII., p. 80,) Brodie, (*Cyclop. of Pract. Surg.*, etc., p. 182,) Gensoul, (*Lanc. Franç.*, t. II, p. 220,) Clot, (*ib.*, t. IV., p. 96,) Roux, (*Arch. Gén. de Méd.*, t. XV., p. 467,) &c., have each had the misfortune to see at least one of the patients on whom they had performed this operation, perish. The second case operated upon by Delpech, (*Ibid.*, t. XVII., p. 301,) died at the expiration of two months; and that of M. Carmichael, (*Cyclop. of Pract. Surg.*, p. 182,) died on the fifth day. One of those of M. Pelikan (*Graefe and Walther, Journ.*, etc., t. XIII., p. 510) died on the tenth day and the other on sixtieth, (*Journ. des Progrès*, t. II., p. 229, 2e série.) The case of M. Dieffenbach, (*Bull. de Férussac*, t. XII., p. 237,) survived only ten hours. I have performed the operation twice, and both patients died, one on the third and the other on the fourteenth day. M. Sédillot, (*Gaz. Méd de Paris*,



1833, p. 923,) M. Blandin, (*Journ. Hebd. Univ.*, 1835, t. IX., p. 369,) M. Gerdy, (*Bull de Thér.*, t. VIII., p. 318,) and Vidal, which last I assisted, have not been more fortunate, and it would be too easy to multiply at the present day similar examples. The two patients operated upon by Kerst both died, and Dupuytren has told me that he had had the same misfortune in three of his cases. M. Larrey, however, seems to give it the preference even in cases where it would be practicable to make the section of the bone between the articulation and the little trochanter.

I am fully of his opinion in this matter. The cases that have occurred in my own practice, and the two amputations of this description that I have had an opportunity of examining, have satisfied me conclusively that he is right. My patients were in such a state of exhaustion when they desired to be operated upon, and the disease had made such progress towards the pelvis, that I can scarcely comprehend how they were enabled to support such lesions even for a few hours. Those of Barbet, Keer, Baffos and Delpech, died in consequence of the progress of their primitive affection, and not from the effects of the operation. In the other cases the disease was of so serious a character that a pure and simple amputation of the thigh, had it been allowable, would probably have had the same result.

[In 98, cases of amputation at the hip-joint collected by Dr. Stephen Smith, (*New York Journal of Medicine*, September, 1852,) 56 died. M. Sedillot states in the second edition of his *Traité de Médecine Opératoire*, tom. prem. 2d part, p. 457,) that he has had a second successful case, and he also refers to another in the practice of Morel. Within two years past, three fatal cases have occurred in the hands of Drs. Webber and Van Buren of this city, and of Mr. Charles Guthrie, of London. We have, therefore, 103 cases and 59 deaths. Mr. Guthrie remarks in his *Commentaries on Surgery*, p. 77, that Professor Langenbeck, when lately in London, informed him that he had performed this operation several times during the Holstein war, and he believed more than once successfully.

In the report of a successful case of amputation on the hip-joint, (*Ed. Med. Surg. Journ.* vol. XXI, p. 27,) Prof. Syme remarks: "I firmly believe that if the operation be done properly, and above all, quickly, its success will be general, if not uniform." On the 5th of January, 1853, Mr. Mackenzie, performed this operation "in less than ten seconds," and though scarcely a teacupful of blood was lost, at the time, yet secondary hemorrhage supervened some eight days afterwards, which proved fatal.

Mr. M. attributes the greater success at the present day, to the improved modes of operating, the use of anæsthetics &c., by which the effect of the shock is modified. (*Dub. Med. Press*, p. 182, March 22, 1854.)

G. C. B.]

Therefore a comminuted fracture, a necrosis, caries, osteo-sarcoma, spina ventosa, or any incurable degeneration whatever, of the femur, extended above its shaft, or gangrene, or any other disease in fact which has progressed nearly as high up as the haunch, and which is of such serious character as to demand amputation, will claim disarticulation provided the cotyloid cavity and the bones of the pelvis are not affected.

Wounds from fire-arms, with lesion of the bones in the upper third of the thigh, are the circumstances under which it is most decidedly indicated. As it then becomes important that the instrument should be carried to some distance above the disease, I cannot see why we should hesitate to make trial of it. The reasoning and the facts already known on this subject, induce us to believe that, other things being equal, it is not more dangerous than amputation at the most elevated fifth of the femur. Its execution is more easy and infinitely more prompt; nor is the wound much larger. We divide the same muscles and the same vessels, and there is no need of so much tissue to effect coaptation. Let it be performed under circumstances less desperate, and I am convinced it will give a reasonable proportion of cures, (*See Excision of the Head of the Femur*, infra.) [It is thus seen that Professor Velpeau fully coincides in opinion with Baron Larrey against the proposition of Mr. Syme, who would always amputate rather at the trochanters than disarticulate the femur. See note on Mr. Syme's views below. T.]

C. *Anatomy*.—The head of the femur constituting more than a hemisphere, is so enveloped in its fibrous capsule that it will continue there as if strangulated in it, unless its section has been made near the cotyloid border. It is this, doubtless, which induced M. Weber (*Arch. Gén. de Méd.*, 2e série, t. XII., p. 238) to think that it is kept in its place by atmospheric pressure. The circumference of its transverse plane (plan) on which rests the axis of the femoral neck, obliquely outwards, downwards and slightly backwards, being about to be exposed to the action of the instrument at the moment of the operation, the surgeon must not lose sight of it. The arrangement of the internal ligament is such that when stretched by the head of the femur upon our reversing the limb outwards, it will almost present itself spontaneously to the cutting edge of the bistoury. It is true that when we commence on the outer side of the joint, it is found relaxed in proportion as we incline the thigh inwards; but as it in no manner interferes with the luxation of the bone, we may divide it with great ease upon the inner side of the cotyloid cavity.

The coxo-femoral articulation, covered outwardly by the psoas and iliac muscles, and slightly by the rectus femoris, and on the inside by the pectineus muscle and the vessels and nerves, is more superficial in front than in any other place, and corresponds here to the union of the middle and outer third of Poupart's ligament. Behind it is separated from the integuments by a space of considerable size, which is filled up by the third adductor, quadratus femoris, semi-tendinosus, semi-membranosus, biceps, obturators, gemelli, and pyriform muscles, together with loose or adipose cellular tissue, the great sciatic nerve and some vessels. A triangular notch filled up by the glutei muscles and *fascia lata*, bounded by the great trochanter below and by the external iliac fossa above, separates its outer side from the skin, while the great trochanter itself is almost naked under the integuments. Upon its inner side is observed a kind of gorge formed by a concavity upon the femoral neck, which descends to below the little trochanter, and which is filled up by the principal mass of the adductor muscles and the gracilis, the terminations of the psoas and iliac muscles, and of the pectineus, all which obliges us to look for the capsule upon a plane much more nearly

approximated to the symphysis pubis, and one much higher up than the axis of the limb would seem to indicate.

A point not to be neglected in a case of embarrassment would be the lines drawn from the antero-superior spinous process of the ilium, from the great trochanter or crest of the pubis, to measure the distance which separates those different points from the articulation; but the above directions will usually answer for the surgeon grounded in anatomical relations. The great and little trochanter, even the head of the femur continuing in a state of cartilage up to the age of ten or fifteen years, could, if necessary, be divided in young persons by the knife if it should prove difficult to get round them at the time of the operation. The anomalies which may be presented by the cotyloid cavity, the tuberosity of the ischium, the neck of the femur, and the projections which are around its base, have scarcely any other relation than to the length, prominence or direction of these different objects; consequently they very rarely present any real difficulties at the moment when the instrument is in the act of disarticulating the thigh.

*D. Operative Process.—I. Circular Method.—a. English Process.* Abernethy appears to have been the first who conceived that the amputation of the thigh at the joint could be performed by the circular method. This surgeon first causes pressure to be made upon the artery on the body of the pubis, then incises the skin, and afterwards the muscles at some inches below the articulations; then separates the muscular tissues from the great and little trochanter, divides the capsule, luxates the bone, cuts through the inter-articular ligament, removes the limb, ties the different arteries, and finishes by bringing together the lips of the wound from before backwards, and keeping them in contact by strips of adhesive plaster.

M. Colles is not the only person who has employed the method of Abernethy on living man. M. Krimer has also followed it. Dr. Weitch, who also prefers it, before looking for the articulation, lays bare the femur downwards, to the extent of two or three inches below the incision of the soft parts, in order to make use of it afterwards as a lever to disengage the bone from its socket; a precaution, however, altogether useless, for it is always practicable, after dividing the capsule, to move the limb in this or that direction, with all the force that may be required.

*b. Process of M. Graefe.*—Circular amputation is also culogized by M. Graefe, who uses it, in fact, for almost all disarticulations. As at the shoulder, so at the thigh, he makes use of his large knife to divide the tissues, entering with it from below upwards, and moving it in such manner from the skin to the head of the bone, as to dig out as regular a hollow cone as possible. Having noticed that the head of the femur was sometimes difficult to enucleate, M. Graefe advises that the cotyloid border should be divided upon the notch of the same name; but if the operator takes care to divide the fibrous capsule accurately upon the largest circle of the articular head, as I have pointed out, he will have nothing to fear from this inconvenience, which, according to M. S. Cooper, presented such difficulty to a celebrated practitioner of London, that he was for half an hour at work in disarticulating the bone.

*II. Flap Method.*—The flap method has been almost always preferred for this amputation. A multitude of different processes, moreover, have



been devised for this purpose. I will not notice those of Ravaton, Moublet and Petit-Radel, because they are too complicated or too difficult. Barbet, Perault, and M. Baffos, having only been called upon to finish, so to speak, what nature had begun, have consequently had no particular method of proceeding to be described.

*a. Process of Lalouette.*—We find described in a thesis under the presidency of Lalouette, who was a relative of Le Dran, one of the best processes that can be employed. This consists, says Louis, who describes this mode of proceeding, and which was adopted also by Gouraud, Puy and Lecompte, in commencing with an incision nearly semicircular upon the outer part of the thigh, so as to disarticulate the femur before all other things, and then in finishing with the section on the inside in such manner as to leave a flap of four to five fingers' breadth.

The following is the manner in which it is described by Theroulde, (*Thèse de Haller*, t. V., p. 265, ou Trad. Franç., t. IV., p. 45 :)—A tourniquet compresses the artery; the patient is placed upon the sound side; the operator makes a semicircular incision, which begins above the great trochanter, terminates at the tuberosity of the ischium, and penetrates down to the joint. He then, while an assistant brings the limb inwards, opens the capsule with a second stroke of the knife, luxates the femur, divides the remains of the capsule, grazes the neck of the bone, and terminates by cutting a flap on the inside of greater or less extent, according to the greater or less degree of embonpoint of the patient. M. Lenoir, (*Jour. Hebd. Univ.*, t. V., p. 205,) who extols this method, effects compression upon the artery by means of the hand of an assistant, who, as soon as the articulation is divided, presses against the vessel with his thumb in the thickness of the tissues.

*b. Process of M. Plantade.*—Many persons have thought that it would be more advantageous to place the flap wholly in front rather than on the inside of the thigh. M. Plantade, who was one of the first to broach this idea, viz., in 1805, proposes that we should cut out the flap by means of three incisions in the same way as for the scapulo-humeral flap of La Faye, that we should divide the articulation on its antero-internal surface, and terminate by making a very small flap behind.

*c. Process of M. Manec.*—In April, 1831, M. Manec showed me on the dead body, the manner in which he had modified the process of M. Plantade. The knife being directed to the middle of the space which separates the spine of the ilium from the great trochanter, is carried from above downwards, and from without inwards, between the muscular tissues and the antero-internal surface of the femoral neck, so as to come out in front of the ischium, and immediately form a large flap, whose free semilunar border looks downwards and outwards. An assistant immediately grasps this flap, and raises it up, taking care at the same time to compress the artery, unless we should prefer to apply the ligature to it before proceeding farther. In terminating, M. Manec divides the outer and posterior soft parts, by the semicircular incision of Moublet and before disarticulating, or he first divides the joint, and does not divide the soft parts till the last. This last method, which M. Malgaigne attributes to Béclard, and which M. Robert has systematized, is one of the best. M. Lenoir, who adopts the first stage of this modification, proposes, and with good reasons, as it appears to me, that after

the formation of the flap, we should always terminate the section of the soft parts, as if we were performing the circular amputation, and before we proceed to the disarticulation.

*d. Process of M. Ashmead.*—M. Ashmead, a surgeon of Philadelphia, also communicated to me in April, 1831, a process founded upon the same idea as the preceding. Like M. Manec, he gives the semilunar form to his flap, and like M. Plantade, he cuts it from the skin to the deep-seated parts. After having made the incision into the integuments on the region indicated, he raises them up a little, in order to lay bare the artery and tie it. Indifferent as to the hemorrhage, he proceeds to the section of the muscles, reaches the capsule, disarticulates the femur, and finishes like M. Plantade or M. Manec.

*e. Process of Delpech.*—A process, which gives a result almost the same, in every respect, as that of Lalouette, is that of Delpech. This professor first ties the femoral at its emergence from the crural arch; then cuts an inner flap by plunging a narrow one-edged knife from before backwards, between the gorge of the femur and the soft parts, directing it downwards towards the skin, and with greater or less rapidity. This flap being formed, is grasped and raised up by an assistant. The operator then gives a semilunar shape to its base, comes down upon the inside of the articulation and divides the fibrous capsule and inter-articular ligament; he then causes the thigh to be placed in its natural position, makes a semicircular incision below the external iliac region, unites in this manner the anterior and posterior extremities of the base of the flap, and makes a little nearer the great trochanter the section of the three glutei muscles, the obturator internus, the pyriformis, the gemelli, and the outer side of the capsule. Nothing remains but the arteries and the dressing. Delpech maintains, that with a single flap immediate union is more easy and certain. A gentle pressure, says he, easily induces the fleshy tissues to mould themselves to the cotyloid cavity, which prevents inflammation, suppuration, exfoliation of the cartilages, and fistulas. Moreover, as his flap presents a very long, oblique cut, he prefers that upon the outside the section of the integuments should be somewhat more elevated than that of the other parts, in order that there may not be too much skin, and that the coaptation, which he also favors by means of the suture, may be more perfect.

*f. Process of M. Larrey.*—Le Fébure, who wrote to Louis about the year 1760, to inform him of the result of his researches, had already proposed to tie the femoral artery in the fold of the groin before commencing the operation. M. Larrey has made a precept of this precaution, which, he says, allows the surgeon to proceed with greater security, and saves an infinite deal of risk to the patient. The artery being tied, and the operator placed on the outside of the limb, directs the point of a long knife to a spot about two or three fingers' breadth below, and within the antero-superior spinous process of the ilium, so as to fall directly upon the anterior surface of the bone; he then inclines it a little inwardly, glides it along the inner side of the neck of the femur, and thus continues to direct it backwards, until it cuts through the skin in the sub-ischiatic groove; he then cuts out an inner flap about four inches long, in the same manner as Delpech; raises up this flap, and then divides the capsule to the extent of half its circumference at least,

and very near the cotyloid cavity, as if he were about to pass transversely through the middle of the head of the femur without attempting to enter the articulation; then places the limb in abduction, luxates it, and stretches and divides the internal ligament; passes his knife upon the outer side of the articular head, and completes the section of the capsule; arrives at the tendon of the glutei muscles, and behind the great trochanter; inclines his knife flatwise, grazes the outer surface of the body of the bone, and makes a second flap as much like the first as possible. All the arteries being tied, the two flaps are brought into coaptation, taking care to leave the ligatures in the posterior angle of the wound, which serves as a filter to the discharges.

M. Larrey (*Clin. Chir.*, tome III., p. 613) has since described *another process*. The artery being tied, he cuts the skin circularly, makes an inner and outer flap, disarticulates, and then finishes by dividing the attachment of the glutei muscles.

*g. Process of A. Blandin.*—It appears that when M. Larrey published his method in 1803, the process with two flaps had long been in use with military surgeons. That which Blandin had successfully employed in 1795, consisted in first tying the artery, and making a first flap as M. Larrey does; but instead of continuing from within outwardly, like the last-mentioned surgeon, A. Blandin cuts his outer flap before attacking the capsule, or proceeding to disarticulate.

*h. Process of M. Lisfranc.*—M. Lisfranc (*Arch. Gén. de Méd.*, t. II., p. 161) makes use of a narrow knife with a double cutting edge; plunges it in from before backwards, and outside of the neck of the femur; goes round the great trochanter, and thus begins by forming an outer flap of three to four inches long; brings back the instrument to the upper angle of the wound; inclines its point a little inwards to glide upon the gorge of the bone; then immediately elevates the handle; draws the fleshy tissues inwards, in order that the knife may, without again touching the integuments, strike below the ischium; he then cuts all the tissues without leaving the femoral bone, until he encounters the little trochanter; he now goes round this osseous projection, and directs an assistant to grasp the root of this second flap by introducing his thumb into the wound, and thus compressing the artery; and finally terminates the section of the soft parts on the inside the limb, as M. Larrey does; and ties all the vessels, and then proceeds to the disarticulation.

*i. Process of Dupuytren.*—The surgeon places himself on the inner side of the limb, and if he is ambidexter, makes use of the right hand for the right limb, and the left for the left; draws back the integuments towards the pelvis, himself supports the thigh, and inclines it more or less in flexion, extension or abduction; then makes a semi-lunar incision on the inside, with convexity downwards, and which commences near the antero-superior spinous process of the ilium, and terminates near the tuberosity of the ischium; at first, he divides only the skin which is immediately drawn back by an assistant; forthwith divides the muscles in the same direction, and thus cuts out an inner flap from four to five inches in length; this he causes to be raised up, and he then attacks the capsule in the same manner as M. Larrey, cutting through the articulation, and terminating with his outer flap. The successful issue in the case of M. Hysern, is due to this process.



*j. Process of Bécларd.*—Placed outside the hip-joint, Bécларd commences with cutting an outer and posterior flap, by plunging in his knife obliquely from without inwards, and from before backwards, from the neighborhood of the iliac tubercle to the inner extremity of the sub-ischiatic groove, grazing as he proceeds the posterior surface of the neck of the femur. A second flap is to be formed in the same manner in front, and the operator finishes with the section of the capsule and the disarticulation. With Dupuytren and Bécларd, the artery was secured only by making pressure upon it on the pubis.

*k. Process of M. Guthrie.*—Two semi-lunar incisions, the one inside and in front, the other outside and behind, and extended from the neighborhood of the spine of the ilium nearly down to the tuberosity of the ischium where they united, characterize the process of M. Guthrie. This surgeon cuts through the integuments with the first stroke and then causes them to be raised up; he then reapplies the knife on a line with the retracted skin, in order to divide the muscles obliquely from below upwards; thus arrives upon the joint after having formed two flaps, and finishes like A. Blandin, Abernethy and Bécларd. It is evident that the process of the English surgeon differs from that of Bécларd, only in dividing the tissues from the skin to the bones in place of dividing them from the deep-seated to the superficial layers; but it is precisely in this particular that it has in reality some advantages.

*l. A large flap on the inside, and a small one on the outside.*—In the process of M. Kerst, which serves as the base of that of M. Manec, a knife with a double-cutting edge, is plunged from before inwards, and as near as possible to the articulation. Its point comes out behind; an inner flap is then cut out, of sufficient length to cover three quarters of the wound, and the articulation sometimes laid open by the same stroke. The thigh is placed in abduction, and the capsule and round ligament divided; the bone is then luxated, and the operation completed by cutting a small outer flap. The artery is compressed upon the pubis.

*m. Process of the Author.*—1. A postero-external semi-lunar incision upon a line with the great trochanter; 2. An antero-external incision for a cutaneous flap of two inches in length, which is raised up; 3. The section of the muscular tissues from before backwards; 4. The semi-circular section of the capsule near the cotyloid border; 5. Luxation and then division of the internal ligament; 6. Separation of the limb posteriorly.

III. *Ovalar Method.*—The ovalar method has not yet been applied on living man for amputation of the thigh at the joint, but in a very small number of instances; it is, however, the one which obtained for M. Baudens the successful issue to which I have referred in his case. The two modifications which it embraces, have been made trial of on the dead body, first by MM. Cornuau and Scoutetten, and afterwards by all the young surgeons who are in the habit of exercising themselves in our amphitheatres, in the manipulations of operations.

*a. Process of M. Cornuau.*—The patient is laid upon his sound side. The surgeon placed behind the hip, is first to make an oblique incision, which is to be carried from above the great trochanter backwards, outwards and downwards to below the ischium; a similar incision is made in front and upon the inside; then with a second stroke

for each incision he divides the muscles as deeply as possible; attacks the articulation on its outer surface at the same time that the limb is placed in abduction by an assistant, and then divides the joint from without inwards as soon as the head of the femur is luxated. He then at last, while another aid raises the two lips of the wound, makes the section of the inter-osseous ligament, the inner portion of the capsule, and of all the soft parts on the inside which separate the two first incisions, or which form the base of the V and of the triangle which they had at first circumscribed.

*b. Process of M. Scoutetten.*—The operator first plunges in the point of his knife above the great trochanter; then depresses its handle a little in order to divide all the tissues as in the preceding method; then brings back the knife to the posterior extremity of the first wound, and returns upon the other side of the limb in order to unite this last incision with the apex of the first wound. If any tissues remain between the postero-internal part of the neck of the femur and the wound of the integuments, the operator divides them and then finishes with the disarticulation.

*E. Dressing and Relative Value of the Different Methods.*—In respect to these numerous processes I can only repeat what I have already said on amputation at the shoulder. Almost all of them are of a character that render them applicable in practice; nor should any of them be adopted exclusively. Nevertheless, as several of them are only very simple and natural modifications of the others, some of them in reality may conveniently be dispensed with without any disadvantage.

I. In the *circular method*, for example, which is incontestably the most disadvantageous, and which never should be selected except in cases where the degeneration of the integuments has involved the whole circumference of the limb nearly as high up as the hip, the process of Abernethy and that of M. Graefe, differ only in that of the German surgeon admitting more easily than the other of the union of the lips of the wound. The modification proposed by M. Weitech, has no other advantage than that of permitting us in cases of fracture to remove the limb first without proceeding to the disarticulation of its upper fragment until afterwards. A precaution which I would not neglect to take, would be to dissect and carefully turn back all the sound skin, in order to divide the muscles very high up and very near their origin, and to take as much of them away as possible.

II. The *ovalar method* is practicable every where, where that with two flaps would seem to be applicable. It makes a wound and flaps almost as regular as the circular method, offers no obstruction to immediate reunion, and enables us to fill up very accurately the cotyloid cavity. The two modifications also which it comprises have scarcely any advantage over each other. I should, however, prefer that the cutaneous layer should be divided lower down, and that of the muscles higher up than is recommended. We should thus be enabled to effect the approximation of the lips of the wound with greater ease, whilst inflammation, reaction and suppuration would be moderated in their intensity. By applying to the great trochanter after the manner of Ravaton and M. Malgaigne, (*Man. de Méd. Opér.*, p. 354,) the longitudinal incision which constitutes the point of departure in the process

of M. Larrey in the disarticulation of the shoulder, we should obtain all that we could hope for from the ovalar method.

III. Among the *flap processes*, those which comprise two, become in some sort a matter of necessity, when it is possible to give them the same length, and when the soft parts are equally degenerated in every direction. In such cases the process of Dupuytren and that of M. Guthrie are preferable to all the others by the security of the operation, because they allow of our saving more skin than muscles, and because the flaps by being formed obliquely and not on each side as in the processes of A. Blandin, and MM. Larrey and Lisfranc, fill up more readily and more completely the cavity left by the head and neck of the femur and great trochanter.

IV. When the *outer flap* is cut in the manner of M. Larrey, it rarely happens that it does not present a notch on its lower border, and that it possesses a thickness which will correspond with that of the inner flap.

V. The method with a *single flap* should have the preference, where the soft parts on one side are degenerated and those on the opposite side sound. In such cases the nature of the diseases indicates in what direction the flap should be formed, and which should not be placed on the outside or posteriorly except where it is impossible to do otherwise. For the inside and front I should prefer the process of Lalouette to that of Delpech, and much better still one of the modifications recently proposed. The process of Lalouette, after the manner in which it is performed by M. Lenoir, gives a much more regular flap than that of the Professor of Montpellier; but this flap is too thick and not sufficiently large. That of MM. Ashmead and Manec is situated in such manner, that dragged down by its own weight, it falls over of itself, so to speak, upon the whole extent of the bleeding surface. By cutting it from the exterior to the interior, as M. Ashmead does, we are more sure of what we do; the ligature of the artery may be omitted, and we preserve more of the integuments than of the muscles.

VI. I proceeded in this manner with the two patients I have mentioned above. After having dissected up the skin to the extent of three inches in front and within, and made a semicircular incision outwards and backwards above the great trochanter, I proceeded to the section of the muscular tissues, and disarticulated from before backwards, without paying any attention to the artery, which an assistant kept compressed against the pubis; the operation lasted only half a minute.

VII. The *previous ligature* of the femoral artery, as recommended by Lefébure, Moublet, A. Blandin and Brulatour, adopted by MM. Larrey, Delpech, Orthon, and Roux, and rejected by Abernethy, and MM. Baffos and Guthrie, [also used by Dr. Mott. T.] is, as we have said, another operation superadded to the principal one. Nevertheless, if in the flap method the compression upon the pubis, or, what is as well, by means of the fingers upon the root of the limb, as we may do in following the processes of Lalouette, M. Lisfranc, and Delpech, and even the ovalar method, should not give all the security desirable, the cutting down upon the femoral artery under Poupart's ligament is, at the present day, an operation performed with too much facility to prevent our commencing



our incision at that point, in the event of our not being disposed to follow the recommendation of M. Ashmead.

Nor can I perceive, unless the patient is very much enfeebled, or the operation is going to be very long, how it can be indispensable, or even advantageous, to tie the other arteries before completing the disarticulation. The fingers of intelligent assistants, applied over them in proportion as they are opened, I have fully satisfied myself, are quite sufficient to allow us to proceed on and finish the removal of the limb without any apprehension. These arteries, moreover, are the obturator on the inside, the ischiatic externally and posteriorly, and then in front and also externally, some branches of the gluteal, or of the internal pudic; it will be necessary, also, if the previous ligature has been used, to tie the femoral artery a second time near the surface of the wound, as well as the profunda artery, in order to be enabled to effect immediate union of the little wound we have been obliged to make at first. M. Dubereuil (*Tourette, Essai sur l'Amputation de la Cuisse*, p. 18) mentions a patient who died of hemorrhage in the space of three hours, in consequence of having neglected to tie in this manner the femoral profunda; and he recommends that, to protect ourselves from such an accident, we should lay bare the femoral with the nail from below upwards, as high as under Poupart's ligament.

VIII. The necessity of placing into as perfect contact as possible the two sides of the enormous wound produced by the disarticulation of the thigh, is disputed by no one. The suppuration from so large a surface would soon cause the death of the patient by exhaustion, and would not fail to be accompanied by a violent general reaction. The suture, whose importance Delpech has endeavored to enhance, has several times been made use of, and we must confess that this is one of those cases which appear to be best calculated to justify its employment. It cannot, it is true, be applied without pain; but if the resource is useful, should a little more or a little less suffering influence us in the presence of such an evil? I would, however, remark, that it is not the wound of the integuments which it is especially important to unite, but on the contrary, that of the deep-seated tissues; and that it is to be feared, that, by means of the suture, the matters that might accumulate at the bottom of the wound would produce serious mischief before they could make their escape externally. The adhesive plasters, which have the advantage of causing no strangulation, readily allow, at the expiration of a few days, of our bringing the lips of the wound into more accurate contact than we had placed them at first, if the base of the flaps should appear to be properly united. Without, therefore, absolutely rejecting the suture, which is beginning at the present time to get into some repute again in the south of France, I am of opinion that we may in this operation, in fact, that we ought to dispense with its employment, except in those particular cases which the skilful surgeon will always know how to distinguish.

[*Coxo-Femoral Amputation; or, Disarticulation of the Thigh.*—M. Larrey, a very few weeks before his death, viz., as late as Jan. 3, 1842, (See Sitting of the Academy of Sciences of Paris, of that date, in *Journ. des Connaiss., &c., de Paris*, Mars, 1842, p. 131,) upon the

occasion of making a report as one of the commission on the memoir of M. Sédillot on coxo-femoral amputation, still persisted in the opinion which he had always entertained in favor of primitive amputation. He said the thigh could be amputated in its totality as well in acute as in chronic diseases, and that this amputation, where required, should be performed immediately after a wound, and not delayed ; that M. Sédillot had exaggerated the dangers of sanguineous revulsions upon the viscera, as these could be overcome by general bleeding, cuppings with scarifications, &c. ; and that, so far as regarded the danger of spasm from the section of the great nervous trunks, this would be the same after the consecutive as after the primitive operation. M. Larrey considered that, in all cases, the chances of success would be greater if the ligature was previously placed upon the femoral artery at the fold of the groin, the value of which he had demonstrated in the course of his practice.

**SUCCESSFUL AMPUTATION AT THE HIP-JOINT.** By V. Mott, M. D., Oct. 7, 1824. (See *Philadelphia Journal of the Medical and Surgical Sciences*. Philadelphia, 1827, Vol. XIV., p. 101—104, with Plate.)

It is now generally understood that surgical operations are not to be performed until all other curative measures have proved unavailing, or the life of the individual cannot be saved, unless some part be sacrificed



Morr's amputation at the hip-joint. Appearance of the stump when perfectly healed.

for the preservation of the whole. We have, nevertheless, reason to rejoice, that even under exceedingly unfavorable circumstances, these dreaded resources of our art afford a rational prospect of success, frequently enabling us to arrest or remove morbid affections, otherwise beyond reach of cure, and to prolong valuable lives in a state of comparative ease. Were we disposed to enter upon such an inquiry, it might be advantageous to determine how far the outcry against surgical operations, (doubtless just in numerous instances,) has proved detrimental to the interests of humanity, by causing the knife to be withheld in many cases where an intrepid and skilful employment of it would have been followed by the restoration of health, and the avoidance of the excruciating sufferings so often endured for a long time previous to the death of such patients. Without discussing this topic, however, we may be permitted to state our belief that a great number of persons are annually committed to the grave, because proper surgical measures are not enforced, and that these are as often withheld from timidity, prejudice, or ignorance, as from any valid objection.

Amputation at the hip-joint is an operation but seldom required, and always attended with great peril, both to the life of the patient and the reputation of the surgeon; but neither of these circumstances are sufficient to justify any one in asserting that this operation ought not to be performed, or that it may not in a majority of cases prove successful, if it be not too long deferred. The following case may prove serviceable to the profession, by showing that the operation may be advantageously attempted in a patient who would otherwise have speedily sunk under his disease.

George Byles, a healthy boy, ten years old, broke his thigh about two-thirds of its length from the hip-joint; two days after, splints and bandages were firmly, (and injudiciously) applied, which produced great distress, and were removed at the instigation of the boy. PHYSICK'S modification of DESAULT'S splint was prepared by the physician then called in, who pointed out to the father, previous to its application, a projecting point on the outside of the thigh, which was the extremity of the superior fragment, which, by the improper pressure was nearly forced through the integuments. The bone being properly coaptated, the long splint was then applied.

About three weeks subsequent to this period another physician was called in, who recommended the employment of the inclined plane, which was adopted, the boards forming it having pegs at the side. The boy stated that during his confinement to this inclined plane for several weeks, he had in tossing restlessly about, injured the thigh on the inside just above the condyle, which produced a sinuous opening leading to the fractured bone. It is most probable however, that the sinus was formed and pointing, when it was struck against the peg and opened.

He was brought into the city of New-York on the 7th of September, 1824, at which time we first saw him. His countenance was expressive of much anguish, with a white tongue and feeble pulse; his right limb was much enlarged on the outside, resembling a case of spina ventosa. To the touch it was hard and irregular, was exceedingly tender, and when pressed gave excruciating pain. The swelling extended to the great trochanter, gradually diminishing towards the top of the thigh.



Opposite to the greatest enlargement was a sinus, discharging a thin sanious fluid, leading to the middle of the thigh bone, which was perfectly carious. During two weeks succeeding his arrival in the city, medicines were administered with a view of allaying irritation, and imparting tone to the system, but hectic and night sweats, notwithstanding, supervened. As ulcerations began to occur by the side of the tibia, and all the symptoms became worse, it was resolved to amputate at the hip-joint as the only chance of saving the life of the patient.

On the 7th of October, 1824, the patient, after having passed a comfortable night, was placed on the table in order to be operated upon. An incision was made over the femoral artery as it emerges from under the femoral arch, and the vessel secured by ligature. While feeling on the outside of the artery for the lesser trochanter, the pulsation of a vessel apparently but little smaller than the femoral artery immediately below the ligature, convinced us that in this case the profunda femoris was given off above the femoral arch, as we occasionally find it. This vessel was taken up.

Lisfranc's knife was then introduced between the artery and bone, and carried through close by the neck of the femur towards the tuber ischii, thus forming the inner flap. The external flap was formed by cutting from without inwards. The hemorrhage from the veins and small arteries was considerable when the incisions were made, and numerous vessels were taken up: but comparatively little blood was lost during the operation, and the patient was put to bed shortly after it was completed. After the inner flap was cut, some of the surgical attendants examining the lesser trochanter, pronounced that the head of the bone was *not diseased*. In order to satisfy the doubts expressed, the bone was sawed through the lesser trochanter, when it was found to be of the consistence of cheese, being denuded of periosteum on the outer side up towards the joint, and requiring to be removed, which was afterwards done, as originally contemplated.

It is scarcely necessary for us to enter into the detail of symptoms and treatment subsequent to the operation, as nothing occurred worthy of note, except various degrees of irritation of the stomach and whole system, previous to the coming away of the ligatures. The treatment consisted in regulating the diet, and administering anodyne and tonic medicines according to circumstances.

On the 15th of October, eight days from the operation, two-thirds of the stump was healed by the first intention. Between the 17th and 31st of October, all the ligatures, seventeen in number, were removed; and by the 20th of November the whole stump was effectually healed, and the boy had become fat and lusty. There can be no doubt but that this limb might have been saved without difficulty, had the proper treatment been instituted when the accident occurred. When it came under our charge, nothing short of the operation above related, could have saved this boy's life.

The appearance of the stump after the entire recovery of the patient, is very accurately represented in the engraving sketched by my friend, Dr. BELL, of New-York; to Dr. FREDERICK KING, I am indebted for accurate notes of the progress of this case, which was under his especial care after the operation.

[It is a source of infinite satisfaction both to Dr. Mott and myself, to have an opportunity at this late hour, of rescuing another and more important surgical claim from oblivion, by the accidental acquaintance we made during the past summer with the venerable Walter Brashear, M. D., for many years an eminent planter of Attakapas, Louisiana, and a senator of that state.

To our countryman, Dr. Brashear, who was a pupil of the eminent Dr. Ridgeley, of the continental army of the revolutionary war, and also a student at the University of Philadelphia, under Dr. Rush and other famous men of that day, are we indebted as is now ascertained, for the *first* operation, or amputation of the thigh at the hip joint or *coxo-femoral articulation* ever performed in America, and which was followed with complete success. This occurred as early as the year 1806, *only three years* after the illustrious Larrey had revived and perfected this operation in the campaigns of Napoleon.

With that self-neglect of one's own rights, that is ever a prominent characteristic of the diffidence of men of genius, and from his having early in life withdrawn from active practice, Dr. Brashear had never published this case. Dr. Mott therefore, had hitherto supposed that he was the surgeon who in this country had first performed this important operation. With a magnanimity which ever belongs to him, and which we trust will serve as an emphatic lesson to those who in their malignity would rob and calumniate both the dead and the living, Dr. Mott cheerfully abstracts the plume from his own honored brows, that can spare many and much more like this, and affixes it upon the name of the gentlemen to whom it rightly belongs.

As it may doubtless become the theme of future discussion, we take the opportunity of placing here upon the record, a too brief account of the achievement of Dr. Brashear as communicated in his own words, in a letter we have had the honor to receive from that venerable surgeon.

*Philadelphia, August 13th, 1846.*

MY DEAR SIR,

In conformity to promise, I now give you a brief statement of the operation which I performed in Bardstown, Kentucky, in August, 1806, on the hip joint.

The subject was a boy seventeen years of age. Without assigning the causes which led to the necessity of the operation, the same was, after consultation with Drs. Harrison and Goodlet, conducted in manner following:—first premising, that in absence of any knowledge of an established mode for this operation, a common-sense reasoning as to its safety and facility alone dictated the manner of performing it. Therefore an operation of the thigh in the ordinary manner was determined on, as remote from the hip joint as circumstances might justify, (in this case about mid-thigh.) The amputation was performed, and the arteries secured.

The next step was to make an incision to and from the lower end of the bone externally over the great trochanter to the head of the bone and upper part of the socket. The dissection of the bone from the surrounding muscles, was simple and safe by keeping the edge of the knife resting against the bone. The bone being disengaged from its integuments at its lower extremity, was then turned out at a right angle from

the body, so as to give every facility in the operation, to separate the capsular ligament and remove the head from its socket. After the operation, nothing more than ordinary dressings were used, and in the course of a short time the patient removed to St. Louis, where he was living within a few years past.

I am, very respectfully,  
WALTER BRASHEAR.

Dr. P. S. Townsend.

It may be proper to state from the verbal communications we have had with Dr. Brashear, that the injury which led to the operation in question was a fracture of the thigh, complicated with much contusion of the parts, and which from bad management or neglect, or both, resulted in the establishment of an extensive and dangerous suppuration in the neighboring tissues and inter-muscular spaces. T.]

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#### [CONSERVATIVE SURGERY TO SAVE THE LIMB FROM AMPUTATION.]

Among the great reformatations which the brilliant march of modern surgery may count as one of its greatest triumphs, is the introduction of what has not inappropriately been denominated, by Mr. Prior, of Woolwich Hospital, England, the *conservative* mode of treating compound dislocations and fractures of limbs, whereby the human body is saved from the deformity and mutilation of an amputation. Dr. Houston, of Dublin (*Lecture on Modern Improvements in Surgery*, Nov. 4th, 1844; *London Lancet*, Dec. 28th, 1844, p. 393, et seq.) correctly observes, that in regard to amputations, the greatest modern improvement is the *frequency* with which they are abstained from. Amputations, until very recently, we may add, were for centuries performed in the most reckless manner, and without the slightest attempt being previously made to save the limb, so that cripples on crutches from this cause, were to be seen everywhere. Sir Benjamin Brodie, in fact, states in the last edition of his work on "Diseases of the Joints," that he owes to this lamentable haste, (fortunate in its results to him and to science,) with which surgeons resorted to amputations while he was a young man, for white swellings, as soon as their character was determined, the minute knowledge he was thereby enabled to obtain of the true pathology of this disease, particularly in its earliest stages.

Our museums, says Dr. Houston, (*loc. cit.*, *London Lancet*, Dec. 28th, 1844, p. 394,) in this city, [Dublin,] likewise bear evidence of the same practice of early amputation; and, he quaintly adds, those who possess such preparations of disease will do well to take care of them, as they are not likely to get many other similar specimens from the hand of modern surgery. Which remarks, he says, apply also to extirpation of the mamma and testes, ulcers of the legs, hernia, injuries of the head, compound fractures, dislocations, &c.



In respect to operations, then, continues Dr. Houston, (*loc. cit.*), true surgery rather avoids than courts them; and in this respect, unlike what takes place in all other professions, the improvements introduced into it cause a diminution in the emoluments derivable from the practice of surgery. It is a well-established fact, that the incomes of medical men are much reduced from this cause, and yet, nevertheless, they persevere with laudable disinterestedness in their endeavors to effect still further improvements. Is not this, says Dr. Houston, the highest degree of philanthropy? In this city, (Dublin,) more, perhaps, than in any other in the world, is this statement regarding the avoidance of unnecessary operations, true. The diminution, he continues, of surgical operations in this city, is our highest boast; and I make it thus publicly, to contrast with one of an opposite character, which I have heard as having been uttered elsewhere, *for the ignoble purpose of attracting students to the schools*. And I do so still more especially, because I find that the records of the hospitals of Dublin have been pryed into, in order to make a case for the assertion of such a discreditable comparison. But although, in one sense, there is a judicious diminution in the number of surgical operations, in another, there is an increase. Many operations unknown in former days, are now in common practice.

We may state here, that discreditable practices like that mentioned by Dr. Houston, to depreciate the Dublin schools, are not, in our opinion, confined to that city. To declare, however, that a great metropolis, from its vast commerce with all parts of the world, its extensive class of laboring persons, and spread of the manufactures, arts, &c., all growing out of an immense trade, is far better adapted to a great surgical school, from the necessary frequency which must exist for operations in an emporium of this kind, is with this *caveat* what any such metropolis, or mart, however, has a right to, and should promulgate, when contrasting its advantages to the student, over those of inland towns and villages—but no further.

In the inflammation which follows extensive destruction of the soft parts and bones in comminuted compound fractures, we must expect, during the progress of exfoliation, where that, and not reconsolidation of the detached fragments, takes place, to find exhausting and burrowing, fœtid, sanious, and purulent abscesses and discharges; over which ensemble of accidents, even where there are gangrenous sloughs also, and, as sometimes happens with the *tibia* under such circumstances, (P. J. Cabaret, of Angers, *Journ. des Connaissances Medico-Chirurgicales*, Paris, Janvier, 1844, p. 15, &c.) a remarkably abundant and prolonged discharge also from the *medullary canal* of the injured bone, nature will, nevertheless, often completely triumph, as in the case alluded to, though a man aged 45, and enduring all the privations of extreme poverty.

M. Lemonnier, of Mortain, (Manche, France,) has effected a perfect cure by first intention, in a recent case under his care, (*Journ. des Connaiss.*, &c., April 1844, p. 151-2,) where more than one entire half of the *tibio-tarsal articulation* of the right leg was opened in a young man, (a laborer,) aged 18, by the stroke of a hatchet upon the inner ankle. The parts were adjusted, and the teguments brought together by adhesive plasters, covered by lint and compresses, a long splint on the inside

of the leg, reaching to below the plantar surface, and a bandage to prevent the deviation of the foot, the whole being kept moist, without, however, removing the adhesive straps, by decoction of marsh mallows and poppy. The outer dressings were renewed after every few days, without removing the plasters. At each time of dressing, there oozed from the wound a large quantity of purulent, foetid discharge, of a coffee-ground color, which was shortly succeeded by a colorless liquid, of gluey consistence, resembling the white of an egg, (synovia.) The fœtor continued, and the surgeon now very judiciously kept the dressings wet with a weak dilution of chloride of soda. The plasters were removed successively as they became loose, and thus replaced by others. At the end of three weeks the wound improved, the pus became healthy, the granulations appeared, and the synovial discharge ceased. At the end of six weeks the pains had ceased, and the wound was healed; and three months after he could walk perfectly, and had all the natural movements of the foot, extension, &c., without any deviation.

This case certainly shows that we should not be too much in a hurry to amputate where the articulations are laid bare, especially where the wound is made by a clear smooth incision, and the constitution is good.

Two cases have occurred to Mr. Liston, of London, (*London Lancet*, Dec. 28th, 1844, p. 412. et seq.) both in young girls, one aged 17, the other 11, in which a tedious fistulous opening on the inner side of the heel, ending in *caries of the os calcis*, were cured by laying open the diseased part down to the bone, by a T incision on the side of the heel, dissecting up the flaps, and trephining and then scooping out the carious portion of the bone, and dressing from the bottom with dry lint to exclude the air, but with lotions externally, of *solution of iodine*, viz.:—Tinct. Iodin. ʒj., Iodide of Potassium, grs. x., and water ʒviii. The new bone soon formed, and finally healthy granulations filled up the deep cavity, ending in a perfect cure. Mr. Liston has found that the tarsal and carpal bones thus vigorously treated, will often enable us to save the foot from amputation. The general treatment, also, must be generous, to aid the formative efforts of nature.

Mr. Shackles of the Leeds Infirmary, (England,) reports a highly interesting case (*London Lancet*, May 10th, 1845, p. 535) of a girl aged 16, who, caught in machinery, received a lacerated wound three inches long, outside the *right patella*, *penetrating into the joint*, and easily admitting the finger under the patella, with a large contused, lacerated wound also inside of *the left knee*, of which the integuments were much destroyed, the *vastus internus* muscle considerably lacerated, the *patella much ground down* as if rasped by a rough file, and with *an opening into the joint an inch and a half long*; the *synovia* also had escaped, and mingled with the external coagulum. A large piece of integument hanging only by a shred, was detached, after which strips of dry lint were applied to the whole extent of the wound. Upon this dry lint, other strips dipped in *mucilage* were arranged in such way as to *completely prevent contact with the air*; outside the whole, a piece of oiled silk was placed. The same treatment for the wound of the other joint. Patient kept quiet on the back. The dressings were not removed until at the expiration of about eight days, when the suppuration began to show itself. After which, soft dressings were used. In

about a month, the right knee was entirely well, and all its motions restored. In the other, the cicatrix did not finally heal for some months. The diet was generally nourishing, and attention paid to the bowels.

We thus see what can be done by occlusion of air, and mild, soft dressings, judiciously unaccompanied with any straps or bandaging to aggravate by their traction; so in the cases of Mr. Prior, which we speak of in our notes below. Yet, in former times, how readily would surgeons have adopted a different course, and then rendered *amputation* necessary, or have at least caused anchylosis. The success of this mild treatment of the joints, as in Mr. Prior's and other cases, are adverse to the precipitate employment of hard, unyielding, stony encase-ments, like the starch bandage, at least in such wounds.

Mr. Jas. Prior, of the Royal Naval Hospital, Woolwick, relates the case (*London Lancet*, Dec. 21, 1844, p. 366, et seq.) of a laborer whose elbow joint, struck by some machinery, was completely dislocated, and the soft parts and ligaments so lacerated, and torn off and denuded by the blow that the bones appeared to have been dissected clean by the knife. The lower part of the humerus and its condyles projected to near three inches backward so as to be nearly at right angles to the fore-arm, while the heads of the radius and ulna were driven upwards and forwards, and what is singular, without any fracture of the articular extremities, not even of the olecranon. Mr. Prior, finding there were sufficient teguments left sound to cover the wound, that the brachial artery and the nerves of the arm were not injured, and that there was but little hemorrhage, reduced the bones and replaced the soft parts, and thus neatly closed the wound, keeping it in that position by compresses, a roller and a padded splint, with the arm moderately flexed; determining at once *not to amputate*, and to save the arm if possible by what he properly calls *conservative surgery*, too little relied upon, as he thinks, by many practitioners. After many weeks of suffering, during which much inflammation existed in the parts and neighboring muscular tissues, causing several considerable sized abscesses, which were opened, and as well as the wound discharged abundant quantities of pus; and after combating the febrile and local symptoms and pain by bleeding, purgatives, poultices, fomentations and free use of opium internally, the wound, a long time delayed also in its cure by the denudation of the inner condyle, finally healed perfectly, and the limb ultimately was wholly restored in all its functions. Mr. Prior thinks the *elbow and ankle joints* might in many such apparently terrific lacerations be both, more frequently saved from amputation, and the *knee* also perhaps in many instances, notwithstanding the rather unqualified precept of Sir A. Cooper to the contrary. The free *porraceous vomiting*, noticed on one day in the above case by Mr. Prior, we consider to have been caused by the liberal daily use of opiate drinks. We have noticed this kind of vomiting as a not unfrequent result of large anodynes, especially of morphine.

Mr. Prior has treated several other remarkable instances, where, by his plan of surgical conservatism, fragments or extremities of bones denuded in contusions, fractures, &c., even for a length of time, have been saved by mild treatment and by waiting for nature, as he did in those examples, to shoot out the granulations slowly, but surely, to



form the new *periosteum*. Another striking example is that of the left thumb of the engineer of a steamboat, (*London Lancet*, May, 31, 1845, p. 611 à 612,) which had received a violent contusion, and by which the nail and other soft parts on the extremity of the thumb sloughed so completely off as to exhibit, when the dressings which were applied around it for the first days were removed, a perfect denudation of the last or second phalanx from the articulation to its tip. The bone was also perfectly black and offensive. Mr. Prior recommended amputation, but as the patient begged to defer it, the surgeon concluded to try to save the part and did so, using only poultices. In less than half a month the bone had cleansed and granulations began to shoot out beautifully from the sound parts towards the tip till the whole bone was completely covered by the new periosteum, so as to make a good and useful extremity in less than a month—a perfect cure being thus effected without the necessity of amputation, or even exsection of any portion of the bone. This is a very different case, however, from that where destruction of the phalanges of the toes and all the metatarso-phalangeal articulating extremities from gangrene, for example, is caused by their having been frozen. Exsection is then imperative, (see our note, Vol. I.)

As another instance of what nature will do in *restitutions of severed parts*, (see this subject fully treated in our Vol. I.,) Mr. Prior mentions the case of a boy, (*loc. cit.*,) who, in 1815, in the vessel of which he was then surgeon, had about half the middle finger of the left hand near the middle joint so effectually and *neatly* severed by the iron hoop of a cask which fell on it, that nothing but a shred of tegument of the size of a worsted thread was left, yet by soft lint dressing and adhesive plaster around it, aided by splints, a perfect restoration and union was effected.

A case very similar to those above, and which fully corroborates the judicious practice pursued by Mr. Prior, in saving the arm, recently occurred to M. Blandin at the Hôtel-Dieu, Paris, (*Gaz. Méd. de Paris*, Juin 14, 1845, p. 380.) A young man, aged 22, in thrusting his arm through a window, completely tore off the integuments, and the tendon of the triceps down to the condyles of the humerus, with the synovial capsule from the elbow joint as high up as its attachment two fingers' breadth above the olecranon cavity of the humerus, making an ovalar flap which hung down upon the fore-arm, and completely laid bare the humero-cubital articulation, without however any dislocation or fracture. M. Blandin, after freeing the parts from the clots of blood, and finding there were no bits of glass in the wound, raised the whole flap up to its place and kept it there by six interrupted sutures. The arm was kept in a flexed position. Fever and severe pain and inflammation ensued, producing such tumefaction of the parts, manifestly greatly aggravated, however, by the bridling or traction of the sutures, that these last finally tore out, when immediate relief was obtained. The flap being afterwards maintained in place only by a bandage, the absence of all traction and pressure, led to the rapid cicatrization of the wound and a perfect cure in fifteen days without any further accident, leaving, however, apprehension of ankylosis. These facts prove how correct was the estimate of Mr. Prior in his case of the elbow joint, which was a far

more dangerous wound, in taking care to avoid the accidents that occurred to M. Blandin by applying only moderate pressure without sutures; for, as M. Guérin well remarks, (Ib., loc. cit.,) the free dilaceration of the dense, fibrous and aponeurotic and synovial tissues in such large open wounds, into the joints, is itself the reason why such wounds do better than narrow ones; because this dilatation prevents the subsequent strangulation which must ensue when the parts expand under the action of inflammation. The same reasoning, therefore, is correctly applied by M. Guérin in favor of the proscription of sutures in all such wounds. In the case of M. Blandin the arm was probably too much flexed, and kept too permanently in the gutter; otherwise he would not have had to fear ankylosis.

[The practice of making free incisions into diseased joints, is now somewhat extensively resorted to, in consequence of the efforts of Mr. Gay of London, and will doubtless be the means of saving many limbs from amputation. We have seen several instances in which this plan has been adopted, and the results were indeed most gratifying. To Mr. Gay, however, does not belong the credit of originating this practice, as may be seen by referring to the Appendix in the last edition of Cooper's *Surgical Dictionary*. It will there be seen that Professor Trowbridge of our own country, has long been accustomed to treat morbus coxarius in this manner, carrying his incisions between the gluteus maximus and medius muscles, down to the bone, and laying open the joint. He has thus opened the joint in all stages of the disease, and speaks confidently of the safety and utility of this method of treatment. Again, the excision of many diseased joints which were formerly doomed to amputation, now obviates the necessity of this sacrifice to the patient, and even true ankylosis even of the large joints may be remedied, by a resort to Barton's operation. But this matter will be more particularly noticed under the head of the *Excisions*.

G. C. B.]

[*Artificial Legs*.—After a patient has submitted to an amputation of his limb, he very naturally inquires of the surgeon what is the best substitute he can suggest for him, and we know that this question has often given rise to much perplexity. As to the lower extremity, we now have it in our power, to furnish every desirable information upon this point, and for this we are indebted to Mr. B. Frank Palmer, the inventor of the artificial leg which has won the admiration of the most prominent surgeons in Great Britain, France, and this country. During the Great Exhibition in London, 1851, we had an opportunity of inspecting the large number of artificial limbs there presented, and we know that there was but one opinion as to the vast superiority of Mr. Palmer's invention to any hitherto offered. In a word Mr. Palmer bore away the palm, the adjudicators being among the rest, no less than the distinguished surgeon of *St. Bartholomew's Hospital*, Mr. William Lawrence, and the renowned veteran of the *Hotel Dieu*, Roux, recently deceased. We confess that after walking some distance with Mr. Palmer, we did not in the least suspect that he had himself been provided with one of his own artificial limbs, yet such is the fact, his leg having been amputated just below the knee. It certainly is one of the greatest triumphs of American ingenuity.

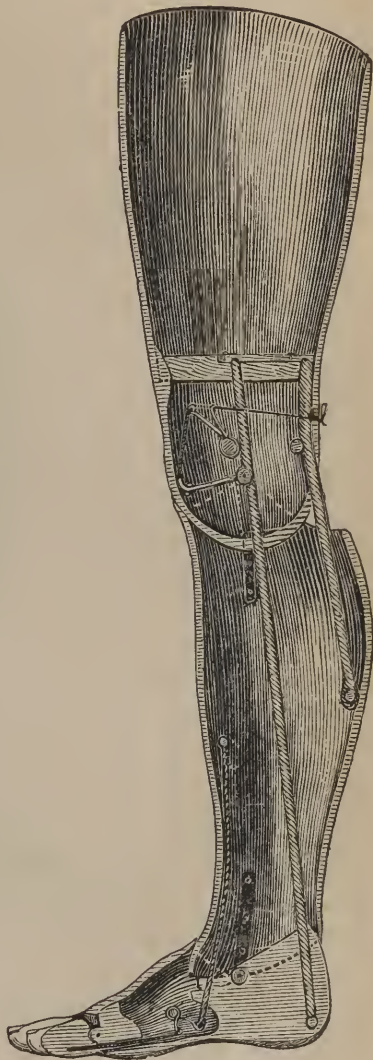
We copy from the pamphlet issued by Mr. Palmer the following description of its peculiarities, remarking at the same time, that through his politeness and liberality we are enabled to present to the reader an internal view of this beautiful piece of mechanism.

The articulations of the knee, ankle, and toes, are united upon a new principle, and in such an improved manner as to present the most natural and symmetrical shapes and proportions, avoiding all vacuums and excrescences. A successful imitation of the ball and socket is introduced, and the ordinary tenon and mortice and metallic joints are never used.

It is composed of the lightest materials compatible with strength and durability. The joints, by a novel contrivance of elastic cords, performing the office of muscles and tendons, allow of an easy, graceful motion, that by a little practice is soon made to correspond with the other limb, and so natural a gait is in a short time acquired, that the loss of the real leg would hardly be suspected.

The joints, at knee and ankle, are united by means of metallic bars placed vertically, and immovably fixed to the sides of the leg. Through the ends of these bars pass smoothly polished bolts upon which the joints move. All the joints are so constructed as to avoid the possibility of any motion where the metallic parts unite. By this arrangement, and by avoiding the rubbing of all large surfaces, *friction* is reduced to the lowest point possible, thus presenting articulations which do not require the application of oil or other attention. The bolts, instead of turning upon mere tenons, or metallic plates, take bearings in solid wood (properly bushed) across the *entire diameter of the knee and foot*, presenting a novel arrangement at once strong and durable.

The Tendo Achillis acts in the strictest accordance with nature. Being attached to the heel, and (by the application of a new and important principle) caused to act upon a dead point in the



Leg straight—internal vein.



leg when the step is taken, it performs its proper functions without tending to bend the knee or render the step insecure.

Another tendon, slightly elastic, and of great strength, receives the shock of sudden extension, and arrests the forward motion of the leg in walking, thus avoiding all unpleasant sound and jarring sensation consequent upon a collision of the solid parts of the knee.

A lever and spring, so inserted in the knee as to act in harmony with these tendons, render the joint *self-acting* when the leg is semi-flexed as in *walking*, but are so arranged as to act upon a dead point when fully flexed in the *sitting* position, and lose the power of extension. An improved spring in the foot performs the twofold office of regulating the ankle-joint and the toes, and its action is certain, adequate and lasting.

The exterior is covered with a strong material, in-

dissolubly fastened, which prevents the possibility of splitting. This covering is fitted without perceptible seam, and the whole is then coated with a cement impervious to water, which gives an enameled surface, and color so natural that the most delicately wrought hose and slipper are sufficient to conceal the work of art.

It is adapted to every form of amputation, and successfully applied to the shortest and tenderest stumps. If amputation be below the knee, and the joint ankylosed, or too short to retain the use of the joint, perfect action is given by an artificial joint without elongating the thigh perceptibly. The peculiar characteristics of this limb, are life-like



Flexed Leg.

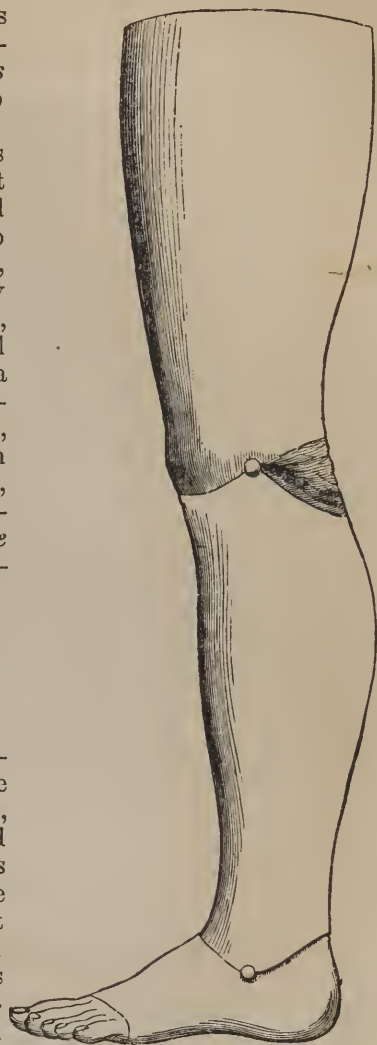
elasticity and flexibility, excessive lightness, adaptability, and perfection of exterior appearance.

We insert also the following views of Mr. Palmer which have special reference to the *comfort* and *usefulness* of the mutilated, who may desire to avail themselves of his substitute :

“ It is obvious that the artificial joints and tendons can never be made to act by mere volition, still the well adjusted substitute may be made to respond to the movement of the living member, and it requires no argument to show that the mechanical limb may be moved, by lever power as readily as the natural one. The stump may be termed a lever, which, aided by auxiliary appendages attached to the thigh or body, moves the false leg. Upon the length and fitness, then, of the stump, depends, in a great measure, the success in locomotion. The *greatest length possible* should be saved, (except when variations of the rule are demanded,) and if the living portion be radically defective in length or flexibility, art, though it may mitigate the suffering, can never fully supply the deficiency.

“ In amputating a thigh, the condyles of the femur should always be fully removed, but *no greater portion*, unless the safety of the patient demand it. The best amputation possible, is of the *leg*, some ten inches below the inferior edge of the patella, though it is always advisable to amputate high enough to secure a good flap, which is very important, as it prevents all unpleasant sensations, such as arise from a slight tension of the thin skin which is too often found to be the only covering of a protruding bone. If a stump must necessarily be less than four inches in length, *below the knee*, amputate just below the tuberosity of the fibula, so that the knee may be flexed and an artificial joint applied without exhibiting a protruding stump. This rule will apply in amputation for ankylosis of knee, if the joint be not diseased ; should it be extended, however, (and stiff,) amputate above the knee. Perfect use of the knee joint should always be secured, even if the stump is too short for use in walking.

“ The stump should be tightly bandaged for several weeks previous to



Exterior view.

the application of the new limb, to compress and solidify the cellular substance and give the stump conical shape. The joints should be rendered capable of the fullest flexion and extension, and then the patient may walk with much facility at the first attempt, maintaining naturalness and precision of step.

"Often in cases which admit of most favorable amputation (near the ankle) a most unwarrantable portion of the leg is removed, and not unfrequently the knee is permitted to remain semi-flexed so long as to become incapable either of full flexion or extension, while in *innumerable* instances a healthy joint is found fully flexed, and permanently *useless* for want of a little care in healing. Such practice cannot be too strongly reprehended. Amputation at the knee or ankle joints is a very objectionable practice, and cannot be too speedily abandoned. In this operation the remaining condyles give enlargement and unfavorable shape to the end of the stump, and the *extreme length* interferes with a perfect combination of the artificial mechanism. Amputation of the foot through the tarsus, is worse for the patient, also, than above the ankle. Aware of the opposition this opinion will meet, we have not ventured to publish it, until able to give the result of experience in treating a number of cases. This operation does not admit of a neat or *durable* substitute, and the leg is more encumbered than if amputated above the ankle joint. If removed through the tarsus, and particularly if no more of the bones than the astragalus and calcis remain, as we have seen in several instances, the point of amputation is invariably drawn downwards by the contraction of the tendo achillis, (its antagonistic muscles being destroyed,) and the patient is rarely, if ever, able to support any considerable portion of his weight upon the heel, and the support is, necessarily, upon a socket enclosing the leg. The false foot and ankle are less perfect, the natural heel cord does not perform its function and an adequate artificial tendon is supplied with great difficulty, if at all."

G. C. B.]

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## SECTION TENTH

### OF THE EXSECTION OR EXCISION OF BONES.

THE operation of exsecting bones, though already performed at the time of Galen for certain bones of the trunk, and, as would appear, for some of the articular extremities, was never actually introduced into practice after fixed rules until about half a century since. It is performed in the continuity as well as at the extremities of the bones, and almost always with the view of preventing the amputation of the limb.



## PART FIRST.

## EXSECTION IN THE CONTINUITY OF BONES.

In the continuity of bones exsection may be required, either for recent compound fractures, ancient ununited fractures, caries, necrosis, osteosarcoma, spina ventosa, or any other incurable organic disease.

## CHAPTER I.

## ON EXTRA-ARTICULAR EXSECTIONS IN GENERAL.

When it is proposed to perform excision or exsection on the continuity of the bones, we require a particular kind of instruments. Those most frequently in use among surgeons are : the cutting nippers, [or pincers,] cutting pliers, saws of different kinds, the trephine, gouge and mallet.

## ARTICLE I.

The ordinary cutting nippers (plate 3,) answers sufficiently well for those points or plates of bone that project, or which may readily be brought to the surface. Its size and form prevent our using it in the depth of wounds. Among the cutting pliers are those of M. Zeiss, (*Gaz. Méd. de Paris*, 1838, p. 375.) They are scissors with short, narrow strong blades, armed with fine teeth and long branches. As they may be introduced into narrow openings, and even into the depths of wounds, they enable us to cut while they at the same time saw through splinters, fragments, and in fact the entire thickness of bones of a certain volume, and thus allow us in a multitude of cases to dispense with the employment of the saw.

## ARTICLE II.

M. Liston has substituted for the ordinary cutting nippers, an instrument still more simple and not less valuable, (plate 4.) The *cutting pliers* of M. Liston differ from the cutting pliers which I have mentioned only in this, that their blades besides being shorter and narrower are provided with a perfect cutting edge. The blades of M. Liston's pliers, which are flat on one side and shaped into a deep bevel on the other, cut wonderfully well the phalanges, and the bones of the metatarsus and metacarpus, and could be used to make the section also of the ribs and all bony fragments which do not exceed these last in size, also in exsections at the bottom of fractures whether recent or ancient.

## ARTICLE III.

Other *osteotomes* more powerful, and constructed after the same idea, have been devised by M. Colombat and M. Manec. Having occasion to perform exsection on the ribs in 1835, I arranged an osteotome in such

manner that its lower blade bent in the form of a hook, allowed the cutting blade to come down with all its power upon the rib without causing it to slip. The cock's comb and the watchmaker's saw, the different kinds of hand-saws and amputation saws, are too well known to make it necessary to describe them here.

But saws which allow of our operating with them in the depth of the tissues, and which have been specially invented for the excisions or excision of bones, require in this place that we should give a short description of them.

#### ARTICLE IV.

The *articulated or chain-saw* invented and described by Aitken, (*Principles of Midwifery*, London, 1784,) (vid. plate 3,) erroneously attributed to Jeffray, (*Excision of Carious Joints*, etc., 1806,) who himself acknowledges that he borrowed it from Aitken, is not less valuable for excisions than for amputations. Another saw which allows of our excising bones wherever they may be situated, and in every possible way that can be conceived, and which acts on bones as the bistoury does on flesh, is that of M. Heine, (plate 6,) composed of the chain-saw of Jeffray, mounted on a series of wheels, and which is moved by means of a crank, at the same time that the hooks (crochets or hasps) and shaft admit of our fixing it or inclining it in any way we wish. This saw, which, according to the author, (*Gaz. Méd. de Paris*, 1834, p. 644,) had in 1834 already been put to the proof on living man on fifty occasions, has no other disadvantage but that of being very complicated and of requiring a certain degree of practice in order to be properly handled. The modification, however, which has been made of it at Paris by the manufacturers Charrière and Sanson, has rendered it sufficiently simple for all surgeons to procure and make use of it.

Toothed rowels, mounted upon a shaft analogous to that of Heine, were thus susceptible of being transformed into *vertical saws* of different diameters, under the names of Thompson's saw, M. Leguillou's saw; &c. But a saw which surpasses these, in its advantages, is that which is called Martin's, (Pl. 7.) This is constructed with a shaft, having some resemblance to that of a trephine, whose crown should be replaced by a disc either flat, (plane,) or convex, in form of a mushroom, and the circumference of which would represent a saw. With this instrument we may excise bones transversely, obliquely or vertically, without the necessity of their protruding beyond the skin. We may even excavate or hollow them out, as artists groove out wood, provided we make use of the convex disc in place of the flat one. A glance at the figure I have given it, will explain its mechanism and construction better than a long description. The small saws of M. H. Larrey, and of M. Rambaud, (Pl. 7,) also deserve consideration.

As to the gouge, mallet, and different portions of the trephine, and the rotatory saw of M. Thall, (*Arch. Gén. de Méd.*, t. I., p. 268,) I have nothing particular to say, or shall speak of them under the head of *Operation with the Trephines*. The same may be said of rasps, levers and elevators, which we may also have occasion for.

## ARTICLE V.

The *articles for dressing* with which we should be provided, are generally sufficiently numerous. Besides those which are demanded for every serious operation, the exsection of the bones of the limbs especially, almost constantly requires also those which are employed for fractures. We must, therefore, have in advance, either splints and bands, or pieces of pasteboard and the bandage of Scultetus, or long bands, and also some of the preparations for making immovable bandages, (For all which, see Vol. I., *passim*.)

## ARTICLE VI.

*During the operation*, also, it is frequently important to put ourselves on our guard against hemorrhages, and to have recourse to provisional hemostatic means, as in cases of amputation. Forced to act upon organs whose mobility is increased, and where every movement sometimes occasions violent pain, the surgeon has need also of intelligent assistants, and a sufficient number of them.

## CHAPTER II.

## EXTRA-ARTICULAR EXSECTIONS IN PARTICULAR.

As to the consequences of the operation, considered under a point of view purely pathological, they are the same as those for compound fractures or amputations.

## ARTICLE I.—COMPOUND FRACTURES.

When in a fracture the extremity of one of the fragments escapes and makes a projection through the lacerated integuments, if the proper dilations and prudently directed efforts are not sufficient to replace the parts, the exsection of the bone which protrudes beyond the wound has always been recommended and practised. The operation, under such circumstances, is one of the most simple. Two assistants grasp the limb, one the upper, and the other the lower portion, in order to increase its curvature, and make the bony points protrude out more from the wound. The operator enlarges the wound, if it should appear necessary, protects the tissues by means of a piece of linen or pasteboard, and makes the section of the denuded bone, either with an ordinary saw, or with any other instrument whatever, suitable to the form and position of the part. The same means are to be recurred to, in a multitude of other cases. If the fragments are sharp and prick the flesh, or if they escape from the wound on the least movement, or are cracked or denuded to such degree as to render necrosis inevitable, their excision would prevent many accidents, and evidently facilitate the consolidation. It is to the tibia and fibula, and to the bones of the fore-arm, and



some of the phalanges, that we are most frequently obliged to apply this species of exsection.

After *wounds from fire-arms*, when the bone, or principal bones of a limb have been shattered or reduced to splinters, and the soft parts are not too extensively laid open, instead of proceeding to amputation, it has been prudently suggested, that we should first extract the detached, boney fragments, and afterwards cause to protrude out of the wound the angular fragments of the two ends of the broken bone, in order to isolate and exsect them. In such cases, the surgeon is almost always obliged to enlarge the primitive wounds, or even to make new ones. He makes his incision usually in the direction of the axis of the limb, at a point which is the farthest distant from the vessels and nerves. By this wound, we cause the protrusion successively of the two ends of the fracture. After having properly isolated them, we exsect the points and all other parts that might interfere with the cure, proceeding in other respects as has been described above.

From the sententiousness of certain passages in Hippocrates, relative to exsection of bones, it would be easy to maintain, that in his time they exsected every thing that was denuded in certain cases of fracture. This is the doctrine of Celsus, Galen, Guy de Chauliac, Tagault, Paré, the two Fabricii, (Jérôme Fabricce, *Opér. Chir.*, pars 1, lib. 4, cap. 10, et Trad. Franç., p. 451,) Gourmeclin, and Dalechamps. Up to the close of the last century, however, we find scarcely any others than Paul of Ægina, (Paul d'Egine dans Dalechamps, *Chir. Franç.*, ch. 107,) and Séverin, (Séverin, dans Ronet, t. I., p. 316,) who have given extension to the operation of exsection, by recommending it upon a more or less considerable portion of the whole calibre of the body of the bones. In the defect of general precepts on this subject we are indebted to the custom of publishing particular cases, for the knowledge we have of some instances of fracture, where exsection has been extensively performed by skilful and enterprising men, who have taken counsel only from their inspiration, and whose boldness has been crowned with complete success.

The first systematic work in which the recommendation of exsection has been generalized is that of Pott, translated and commented upon by Lassus, who refers back to the precepts of Paul of Ægina, and explains, in a very precise manner, the excision of bones. But Hévin abandoned exsection to simple relaxation of the muscles, though Bourbier (*De Necessitate et Utilitate, etc.*, 1776) had supported at Strasbourg a very remarkable dissertation in its favor. *When the bone passes out* (*passe*) *death ordinarily ensues*, says Courtin, (*Leçons Anat. et Chir.*, p. 696, A. D. 1612,) while speaking of fractures of the humerus.

Bourbier sustaining his positions on the authority of the ancients and of Rossius, Diemerbroeck, Scultetus, Roueb, Siebold, Munnicks, and Gaignière, thus expresses himself in his thesis: "Since it is certain," says he, "that the fragments of the displaced bones wound and irritate the neighbouring parts, let us seek in the nature of the disease itself the treatment to oppose to it. We ought to remove *by means of the saw a portion of the projecting bone sufficient to effect the reduction immediately*, and without any concussions or traactions. Then the pain will cease, and to the state of agitation which the patient is in will succeed repose and tranquillity. The apprehension that we shall have

accidents supervene, or that those which already exist will be aggravated, will be alike dissipated." It is a very difficult point here to pronounce on the cases where we should procrastinate or recur to what Severin calls efficacious surgery.

1. Without excision would there be exfoliation of the fragments detached from the body of the bones, but which are still adherent to the soft parts? I have seen splinters of bone that did not reunite, yet retained their vitality in the midst of the tissues. I have seen such in the thickness of the muscles of the fore-arm, and once in the lower part of the arm, in the dead body, in subjects in which the fracture had been consolidated for more than fifteen years.

2. What is the action of such fragments on the secretion of the callus even when they must pass into necrosis, or when they are extracted, what is their effect on the shortening of the limb?

3. If they are of great importance and ought to be removed, how are we to distinguish the cases where their presence would give rise to accidents which would endanger life, or where their extraction would have been more advantageous than their incarceration within the osseous callus?

4. What is the influence of the continuity of one of the two bones (the smallest especially) on the preservation of the length and straightness of the limb and the reproduction of the parts destroyed?

If we remove all the splinters and cut off the ends in the body of the bones, we may possibly indulge the hope of effecting a consolidation of the fracture, at least for the femur, humerus and tibia; but what are the signs which will enable us to distinguish those cases where an operation might result in a pseudarthrosis? Nor is any thing more known of what takes place in relation to the shortening which occurs under these last mentioned circumstances. We find facts for and against the propositions which I have just enumerated. M. A. Cooper has found, in excising a portion of the radius or some other bones in rabbits that a void was left behind, and that no osseous reproduction was effected in the place of the piece removed. Others have seen the reverse of this, and facts in practice authorize us to sustain both the affirmative and negative of this position. The course, also, which surgeons take under these circumstances is far from being uniform. Some confine themselves to extracting the detached splinters and fragments, while they replace the adherent pieces with the hope that they may become united or that nature will expel them. The presence of such splinters in the wound at least lessens, it is asserted, the shortening of the limb, by keeping the ends of the fracture apart, and by serving as a sort of mould or nucleus for the reparative callus. G. Fabricius (Bonet, t. II., p. 185 and 198.) was a zealous partizan of this practice. Others, on the contrary, dilate largely, extract all the detached fragments, empty the cavity and cut off, when necessary, the ends of the fractured bones, in order to reduce the wound to a simple state, and in the hope that they may thus prevent inflammations, consecutive abscesses, delay in the formation of the callus and necrosis; also the retention of the sequestra and the interminable fistulæ which they are so often the cause of, together with those tedious operations which are sometimes necessary for the extraction of the splinters. Le Dran and Bagieu, and especially Bil-

guer, together with Schmucker (Sprengel, t. VII., p. 326—327,) and Thédén, are great advocates of this method, which I have also frequently employed with marked advantages.

### § I.—*Bones of the Hand.*

The importance of the smallest osseous piece to the hand, makes it necessary that we should never sacrifice it, except it be impossible to preserve it. So also it is better, in cases of fractures with crushing of the phalanges or bones of the metacarpus or wrist, to remove the splinters, and to exsect or excise the projecting points, and make the proper dilatations, than to amputate the parts injured. The forceps, cutting pliers, seissors of Liston, rowel saw, that of the cock's crest or the watchmaker's will suffice in such cases. I have in this manner had it in my power, in removing portions of the phalanges, metacarpus or carpus, to save in a great number of patients a thumb, a fore, middle, or even the little finger itself. The operation, in other respects very easy, varies necessarily according to each particular case, and cannot be described.

### § II.—*Bones of the Fore-arm.*

The memoirs of the Academy of Surgery contain two remarkable facts (t. II., in 4to, p. 529; t. VI., in 12mo, p. 141) relative to the extraction of splinters from the two bones of the fore-arm. We find, also, that Bilguer removed a portion of the ulna which had the length of four fingers' breadth. La Franboisière (Bonet, t. IV., p. 237) speaks of a loss of substance in the ulna of the length of four fingers' breadth, caused by the extraction of splinters, which filled up with flesh, and became so indurated as to take the place of the portion of bone removed, without making any curvature in the fore-arm at this place. The extraction of a very considerable portion of the ulna, without causing any change in the form of the arm, was effected at that time also by Dupuytren, (Champion, *Thèse* No. 11., Paris, 1815.) Here is a fact not less remarkable: a fracture of the body of the radius by a fire-arm, (a fusil charged with twenty large slugs, and the barrel against the fore-arm;) the charge remains in the limb; on its palmar side contused flesh, numerous splinters and fragments on a level with the surface, (en flûte,) and denuded. The ulna was laid bare above the fracture. A long incision was made on the radius, in front and behind; the fragments dissected on a line with the denudation, and exsected (by means of a cutelaire saw passed into the two wounds) to the extent of an inch and a half below, and two inches above. Extraction of the splinters and fourteen *balls*.

The contused tendons of the two radial muscles necrosed, and some abscesses supervened in consequence of the slugs scattered throughout the tissues; the wound healed in six months. The three last fingers preserved their movements. The wrist ankylosed. The patient, who was strong and robust, resumed his occupation of mason. There remained between the extremities, in the continuity of the radius, an interval of five inches, which was occupied only by soft parts. The limb,



which preserved its straightness, though there was no reparation of substance, recovered as much strength as the other. M. Champion was assisted in this operation by M. Collignon and M. Pellier of Nancy, who was then there.

Three men, says M. A. Séverin, (Bonet, t. I., p. 316, chap. 10,) vainly endeavored to reduce a fracture complicated with protrusion of the radius externally. The bone-setter, Marc Blaise, could not effect his object. The ends of the bones were exsected with a saw, and the patient recovered. Perhaps the difficulty here arose from the tractions not being made in the proper direction. Deschamps (*Ancien. Journ. de Med.*, t. LXIX., p. 471) relates that it was determined to amputate the fore-arm in a case where the lower fragment of the radius protruded from the wound, and formed there a draw-bridge, the parts had been placed in pronation; when he caused them to be placed back in demi-supination, the bone suddenly entered (into its place.) M. Saint-Hilaire (*Considérations sur les Os de l'Avant-bras, etc.* p. 10, 1814) speaks of a patient in whom it became necessary to exsect the two bones of the fore-arm which had been fractured at their epiphyses, and protruded through the soft parts.

*Operative Process.*—When the removal or excision of splinters and fragments becomes necessary in fractures of the fore-arm, the operation must necessarily vary according as the bones protrude through the skin, or are simply broken at the bottom of the wound. We may enlarge, without any fear, the wound of the integuments. We then give a greater curvature to the limb, and surround and protect the root of the fragment with lincn, pieces of pasteboard, wood or metal, afterwards exsect them with the saw where the whole thickness of the osseous cylinder is to be divided, or with the cutting nippers or pliers, when some points of bone only are to be removed. As a general rule, it cannot but be advantageous to remove a large portion of the bone, and there would be an inconvenience if we did not give ourselves plenty of room in excising it. The radial and ulnar arteries, with their accompanying nerves of the same name, and the median nerve, are the only organs which it is important to avoid. As they are situated in front, and nearer to the axis of the limb than the bones are, the ulna or radius ought, by preference, to be inclined towards the posterior or outside of this axis when we wish to exsect them.

All the points of bone being thus destroyed, we cleanse the wound of the foreign matters it may contain, and proceed immediately to the reduction by making the proper tractions and extension.

If the bones do not protrude externally, when it becomes necessary to remove any portion of them, we begin, unless the tissues are extensively lacerated, by enlarging the principal wounds of the skin as much as possible in the direction of the axis of the limb. By means of a strong forceps, we remove from the wound the splinters and fragments which it may be thought advisable to sacrifice; and then proceed to the excision or exsection of the extremity of the two ends of the fractured bone, if they should be so sharp as to irritate the soft parts, or seem calculated to produce any mischief, (accidents.) During all these manipulations, the fore-arm should be held in a state of flexion, and in such manner that all its muscles may be as much relaxed as possible.

The assistant and surgeon, it will be understood, are to give to the forearm all those inclinations and inflexions which will enable it to check the tension and traactions caused by the fracture.

### § III.—*Bones of the Arm.*

The exsection of a portion of the body of the humerus, in cases of fractures, is one of those which we most frequently have occasion to perform. Science possesses a very great number of examples of this kind. Nevertheless, the formation of a pseudarthrosis was the result of this operation in a patient of Theden, and in the case of Lelong, as mentioned by M. S. Cooper, (Bourbier, *Op. cit.*, § 8.) Most frequently, however, the operation has been followed by complete success.

An infant eight years of age, says Diébold, (*Dict. de Chir.*, t. I., p. 479,) a distinguished surgeon of Strasbourg, fell from a horse and fractured the humerus a little above the epiphysis; the biceps was torn, the bone protruded about two inches, and reduction could not be effected. Twelve days passed on, and gangrene had already attacked the muscles of the arm. Diébold being sent for to perform the amputation, confined himself to exsecting about six lines of the protruded portion of bone, when he easily effected a reduction. It then became necessary to arrest the progress of the gangrene, and to favor the exfoliation of the tendons and of the ligaments in the neighborhood of the articulation, when, after the expiration of six weeks, a healthy cicatrix replaced one of the most frightful looking wounds.

In the case of a *fracture of the surgical neck of the humerus*, noticed by Sylvestre, (*Ancien. Journ. Méd.*, t. XXXIX., p. 275, 1773,) one of the ends of the bone protruded an inch and the other half an inch and they had been in this situation *from seventeen to eighteen days*, during which time frequent attempts had been made at reduction. Three of the surgeons proposed amputation: the wounded man was exhausted. Sylvestre being called in, made, at different times, incisions and counter-openings, and applied pungent substances to the ends of the fractured bone; exfoliation of the upper end of the bone took place; the change made in the inferior end *not having yet enabled it to detach itself immediately*, Sylvestre removed its carious portion with the saw, effected the reduction, then kept the bones in coaptation by four immovable splints, made frequent dressings, healed up the *thirteen* openings in twenty-seven days, and consolidated the fracture in two months. Bourbier speaks of a fracture of the humerus, situated immediately above the condyles, in a boy aged eight years; the upper fragment protruded through the skin on the inner side of the biceps, while the lower was drawn backwards; Notchet, of Laon, could not reduce it, notwithstanding a dilatation which he made of two inches extent, and repeated efforts of extension. On the following day there was a violent pain, with fever and subsultus of the tendons, and the life of the patient in danger. Five physicians and surgeons united decide upon amputation. Bourbier, who arrived on the third day, proposed exsection, which was performed by Gaig-nière. An inch of the bone was removed, when the remainder was replaced with the greatest ease. All the symptoms subsided, and the most perfect success crowned this operation. In three weeks a firm

cicatrix filled up the wound, and the callus was already sufficiently solid to allow of the patient returning to his relations. M. Belair, (*Journ. de Méd.-Chir. et Pharm. Milit.*, p. 233, Mai, 1815, No. 2,) on the twentieth day of the accident, excised from 5 to 6 lines of the upper fragment of the humerus fractured near the shoulder, because this fragment, being denuded, pierced through the skin in spite of the dressing. The patient recovered.

In a case of fracture of the humerus above the condyles, noticed by M. Vial, (*Recueil de Méd. et de Chir. Milit.*, t. IX., p. 271, 1821,) in a child of five years of age, the upper fragment protruded through the flesh to the distance of fourteen or fifteen lines. With these there was also laceration of the brachialis internus muscle, of the inner border of the biceps, of the branches of the internal collateral artery, a copious hemorrhage, and a shortening of the limb of nearly two inches. Compression of the artery, efforts at reduction, extension, graduated compression upon the integuments—in fact, nothing succeeded. The tumefaction and contraction of the muscles strangled the fragment with such force, that it was impossible to introduce a probe between the parts. After having glided under the bone a retractor of wood, cut in a crescent form, a portion of it 14 lines long was excised. The wound healed up in fifteen days, and the fracture consolidated in thirty-three. The movements of the arm were re-established on the *sixtieth* day, without any shortening of the limb! A comminuted fracture of the lower extremity of the humerus, with protrusion of the fragments and separation of the condyles, made it necessary to excise the *upper* fragment during the first days. A protrusion of a part of the lower fragment took place at a later period. A rigid diet, and bleedings renewed as often as necessary, arrested the hemorrhages, which had occasioned much uneasiness. The patient, who has resumed his occupations, says M. Charpentier, (*Société des Sciences Méd., de Metz*, p. 21, 1822,) experiences only some difficulties in the movements of extension of the fore-arm.

A child, aged seven years, fell from a horse on the 15th of May, 1819, and fractured his left arm. M. Heriot, who arrived from Pont-à-Mousson two hours after the accident, found the humerus fractured across its lower portion, and so near the articulation, that the upper fragment included a part of the olecranon fossa of this bone. This fragment, which had torn and penetrated through the tissues and skin upon the fore-part of the arm on the inner side of the biceps, made a protrusion of an inch in the bend of the arm. The brachial artery and the median nerve were found denuded and stretched across the extremity of the bone like the cords of the violin over its bridge. After having satisfactorily ascertained that the tuberosities of the humerus were not fractured, and that the portion of the bone to which they belong was entire, notwithstanding its shortness, M. Heriot proceeded to enlarge the wound up and down, and slit open its borders transversely in the bend of the arm; this did not prove sufficient; the reduction could not be effected. The angles of the humerus were now cut off with a strong pair of scissors, with the hope of liberating the artery and nerve; but these last-named organs were too tensely stretched to yield. The surgeon then made up his mind to tie the artery and divide it, as also the



nerve, and to exsect with the saw, to the extent of an inch, the portion of bone which protruded beyond the wound.

After this operation, the reduction was easy; the patient was placed in bed, with the arm in a position of semi-flexion, and the elbow slightly elevated upon a cushion of oat chaff. The borders of the wound were brought together and dressed with dry lint, after which the limb was covered with an emollient poultice. The ligature came away on the eighth day, and the ends of the bone were united on the twenty-first day. The action of the muscles had dragged the lower fragment forwards, and it was found necessary to let it consolidate in this position. The inflammatory tumefaction continued to the thirtieth day from the accident. The patient could at that time raise his whole arm at once in one movement. At this period the fore-arm was placed in a gutter of pasteboard, supported by a scarf, in order to allow the child to walk about. Two months and a half after the fracture, extension could be performed almost perfectly, and appeared to be in no way incommoded, except by the cicatrix of the wound. Flexion could be performed to two-thirds its extent, and movements of pronation and supination could be executed the same as in its healthy state. The sensibility of the limb was not impaired, and M. Heriot noticed no other result from the section of the median nerve, except a temporary pain in the fingers, especially in the middle finger, of which in fact the patient complained at the time of the operation.

M. Champion, who communicated to me the particulars of this important case, guarantees its authenticity.

The following case, for which I am also indebted to M. Champion, shows what should be done for the other extremity of the humerus.

*Oblique Fracture of the Surgical Neck of the Humerus.*—The lower fragment drawn upwards and in front of the scapulo-humeral articulation, raised up the soft parts above the acromion. Attempts at reduction proved useless though the girl was young (aged seventeen) and of a lymphatic temperament. The inability to effect the reduction could only be imputed to the impossibility of disengaging by the efforts at extension, the lower fragment of the humerus, which was imprisoned in the fibres of the deep-seated layers of the deltoid which it had penetrated. An incision was made into a sero-sanguineous extravasation on this fragment, and the lower extremity of the fractured bone denuded to the extent of eighteen lines. This portion was now exsected, and the cure of the patient effected. A great part of the motions of the limb were restored with scarcely any perceptible diminution of its length.

*Operative Process.*—The humerus which so often places the surgeon under the necessity of performing exsection upon it when fractured, exacts during the operation precautions which it is scarcely possible to systematize under any fixed rules. Both at its middle portion and its extremities it would always be most prudent to begin with the fragment which projects backwards and outwards. For in these directions the dilatation of the wound and the incisions which we are under the necessity of making, compromise only the integuments or muscles. In front, on the contrary, and especially on the inner side, we should have to be on our guard against the wounding of nerves and vessels of considerable size. Perhaps it would be practicable, after having thus given ourselves

sufficient room, to incline the other fragment also in the same direction, in order that we might exsect that also without incurring any additional risk. Nevertheless if the tissues should be lacerated upon the inner side and in front, the operation should be performed in that direction. We must then accurately recal to mind the relations which the brachial artery, median nerve, ulnar nerve, and even the radial nerve, have with the ends of the fracture. And it would not be until after having separated or pushed them to one side or the other by incisions and tractions skilfully managed, that we should undertake to apply the saw or cutting pliers upon the bones, taking care moreover when doing so to give them during the operation a strong inclination, and to make them project as much as possible beyond the integuments.

Whether it be the fore-arm, or the arm, it is important after the exsection of the bones and the removal of the splinters has been completed, that the limb, if it has been fractured through its whole thickness, should be fixed in an apparatus which shall keep it immovable, while at the same time it admits of the daily dressing of the wounds. The starch bandage which perfectly fulfils this indication, is here of great advantage. We should therefore now surround the whole of the fore-arm and arm, from the roots of the fingers to the shoulder, adding at the same time some turns of spica, with a roller bandage interlaid with some pieces of pasteboard and saturated with dextrine, taking care to leave openings at every place opposite to the wounds, so that at the time the desiccation of the dressing is completed, the whole limb may be maintained in the position which we desire it to have up to the termination of the cure. [See note Vol. I. on the starch bandages and their extreme danger when not applied with the precaution pointed out by the author. See also the case of Mr. Dubowitsky, same volume. T.]

If, however, the fracture should not go through the whole thickness of the bone, or if, as I saw in 1830, in the case of a man whose arm had been traversed by a ball, the half or two-thirds only of the calibre of the humerus had been fractured, then after having completed the extraction of the fragments of bone, this bandage would no longer be indispensable, and the wound should be treated like any other wound from fire-arms.

#### § IV.—*Bones of the Shoulder.*

It is seldom we are called upon to perform exsection upon the bones of the shoulder in cases of their fracture; it should be fearlessly made, however, where the bones are laid bare and present pointed fragments at the bottom of the wound. I shall not hesitate, for example, in a case, to excise the ordinarily too acutely pointed extremities of the fragments of a fractured clavicle, if they had lacerated the integuments. One of the wounded of July, 1830, who was wounded by a discharge of fire-arms upon the front part of his shoulder, received thereby a fracture of the clavicle, coracoid process and head of the humerus, all at the same time. After having extracted from different recesses of the wound a variety of projectiles and a great number of splinters, I removed by means of the cutting pliers and cock's comb saw, the projecting points of three bones mentioned, and the patient ultimately got well.

The acromion, notwithstanding it seems by its relations to be indispensable to the functions of the arm, should nevertheless be freely exsected, in cases where it is fractured and protrudes through the skin. After the cicatrization of the wound, the clavicle supported by the coracoid process would take its place completely. As a proof of this assertion I mention the case of a patient who had the whole acromion extracted out entire for necrosis without experiencing any perceptible diminution in the strength or motions of his arm, and the case of another man who with an ununited fracture of the acromion felt no sort of inconvenience whatever from it.

It is unnecessary to add that in fractures of the body of the scapula, the osseous angles, are not to be spared but are to be exsected largely.

#### § V.—*Bones of the Foot,*

The bones of the foot, in cases of fracture, rarely require exsection, except there is also luxation at the same time. In treating therefore of the exsection of the extremities of bones, I shall be permitted to recur for a moment to what relates to them. There are none others but those of the metatarsus which can in reality require any attention in this respect on the part of the surgeon; nor do they then require anything like the precautions which become necessary for the bones of the hand. Thus if a fracture should take place in any one of the bones of the metatarsus, it would generally be better for the maintenance of the functions of the foot to amputate this bone with the corresponding toe, than to exsect the two fragments. We should decide upon this last operation only in the case of a fracture of the first metatarsal bone, or where the digital extremity of each one of the other metatarsal bones had been left unimplicated. The exsection in such cases also should be made with Liston's pliers, the rowel or the cock's comb saw, or with the cutting forceps.

#### § VI.—*Bones of the Leg.*

In cases of compound fractures of the leg, we may have to exsect the fibula or the tibia, or sometimes both bones in the same patient.

A. *Exsection of the Fibula.*—Sculletus, (*Arsenal de Chir.*, trad. Franç., p. 104, 1672,) by means of a cutting pliers, exsected a large fragment of a fractured fibula near its middle, which had protruded through the skin, and which, without this operation, it would have been impossible to replace in its position. The patient got well in four months, and walked as well as if he had never had the leg broken or lost any portion of bone. The splinters removed from a fractured leg in a case of Dupuytren, (Champion, *Thèse* No. 11, Paris, 1815,) comprised the middle third of the fibula to the extent of three inches, yet the patient nevertheless recovered. It is quite rare, however, that exsection of the fibula alone is indicated in fractures; when it is so, the tibia preserves the straightness of the limb.

B. *Exsection of the Tibia.*—The tibia on the other hand, is the bone which surgeons have most frequently had occasion to operate upon under such circumstances. Every body recollects the history of Paré, (*Liv.*



XV., ch. 23,) and the direction he gave R. Hubert not to spare him and to leave no splinter in his leg. Séverin (Bonet, t. I., p. 317, § 954) had repeatedly performed the operation. In a case of fracture of the tibia from fire-arms a little below the knee, Scultetus (*Arsen. de Chir.*, Obs. 93, p. 362, 1672) exsected a portion of bone the day after, and another on the third day; the first was performed with the cutting pliers, the second with a trephine, (because the fragments wounded the flesh.) Diemerbroeck (*Anatom.*, lib. IX., cap. 1., p. 770; trad. Franç., t. II., p. 604) was called to amputate a leg which had been fractured in the middle part, and where the upper fragment of the tibia had plunged into the earth and was found denuded of its tissues and of its periosteum. A skilful surgeon proposed and performed the exsection of the portion denuded which was two fingers in length. The patient recovered without any shortening of the limb. In another case of the leg the tibia protruded the distance of two fingers in breadth outside the integuments. A consultation being had between Munnicks (J. Munnicks' *Chirurgia*, lib. IV., cap. 44, p. 325, 1715, in 4to.) and three of his confrères, the exsection was performed the day after by means of a saw. The leg preserved its original length, nor could the place be distinguished where the operation had been performed. Four inches of the tibia removed in this manner by Van Swieten, (*Aphorism de Boerhaave*, t. I., § 343,) did not nevertheless prevent the patient from recovering without any shortening of the fractured limb. The same thing occurred in two patients mentioned by La Motte, (*Traité de Chirurgie*, t. II., Obs. 380,) though one of them had lost eight inches of his tibia. Bagieu (p. 441 à 457, t. II., 1757, *Examiner*, &c.) who opposes J. L. Petit and Duverney, relates at length the case of the Commissary Lavillurnois, who wished him to cut off his leg, but was cured by an exsection upon the tibia. In a case of comminuted fracture of the two bones of the leg, Bilguer (*Dissert. sur l'Inutilité de l'amputation des Membres*, p. 125, § 36) exsected five inches of the tibia, extracted useless and projecting portions of the fibula, then adjusted the bones, and cured his patient in four months; the leg, though a little shortened, did not prevent the patient from walking or jumping with ease.

Exsection of the tibia, below its middle portion, in a case of oblique fracture, with a riding and protrusion of the bone to the extent of more than two fingers' breadth, was performed on the sixth day by Roueb, (Bazieu, *Examen de plus. Parties de la Chir.*, t. II., p. 516, 1757,) with entire success. Aselmeyer (Obs. sur un Allongement du Tibia, *Gazette Salulaire*, 1763, No. 33) cites another example, as follows:—Compound fracture of the leg, soft parts crushed; exsection of the tibia, which was fractured and deprived of its periosteum to the extent of five inches; there were found six to seven splinters of the fibula, which were also removed. Six months after the patient walked perfectly well, except, says this author, that he required for this foot a heel a very *little higher than the other*. Lieutaud (*Ancien. Journ. Méd.*, t. XXV., p. 254, 1766) who, sent for to a case of oblique fracture with protrusion of the tibia to the extent of three or four fingers' breadth beyond the skin, tried dilatation and efforts at reduction, and finally came to the resection of the fragment, makes no mention in this case of any shortening. In the patient of Wilmer, (*Cases and Remarks in Surgery*, etc., London, 1779,

p. 213,) with a comminuted fracture from crushing of the leg, exsection and extraction of the whole thickness of the bone was performed to the extent of four inches, yet the patient recovered as it would seem without any perceptible shortening. A person had the tibia fractured by a biscayan, [species of fire-arm,] and the bones were displaced and protruded through the skin. The surgeon, says Theden, (*Neue Bemerkungen*, etc., t. II., p. 44, 1782,) removed the splinters, then sawed the tibia above, below the ligamentum patellæ, and afterwards below at four fingers' breadth above the tibio-tarsal articulation. The fracture apparatus was applied, and exfoliation took place at each end of the bone. The cure, nevertheless, was completed at the expiration of twenty-two weeks. The callus was solid, and there was no shortening.

Exsection of more than two inches from the whole thickness of the body of the tibia succeeded also in a case of Ch. Hall, (Letter to B. Gooch, *Med. and Chir., Obs.*, etc., t. III., p. 79, 1773.) The cure was accomplished in three months, and the callus was completed and ossified at the end of five months. The patient could use his leg very well, and it was but very little shorter than the other. B. Gooch (*Ibid.*, p. 82, 1773) adds in a note, that while he was still at Norwich, he recommended a similar operation, which was attended with the most complete success, and that a series of analogous facts have convinced him of the advantages of this practice. M. Gouraud, (*Demonstr. Principes des Opér. de Chir.*, p. 160,) in the case of a child, whose tibia had been fractured obliquely, exsected an inch and a half of the bone, and cured his patient in thirty-three days without any shortening. M. Champion on the 4th of June, 1838, exsected successfully an inch and a half of the upper end of the tibia, which had been fractured almost transversely, and protruded more than two inches beyond the skin. In a patient operated upon by Dumoulin, the exsection of the tibia near the articulation of the foot was followed by necrosis of the epiphysis. Bagieu succeeded equally well in the following case:—A transverse fracture of both bones at one or two lines from the articulation; the foot thrown outwardly and confined [in this position] by the fractured extremity of the tibia after this had pierced through the whole extent of the capsule and skin; reduction was impossible; a lateral incision was first made, and afterwards exsection performed of the whole of the tibia in order to disengage the foot. There followed inflammation, purulent collections and at various times sequestra of the greatest portion of that part of the tibia which remained fixed upon the astragalus, while the remainder of the bone became denuded at a later period; the cicatrix took place by ankylosis, and the patient was enabled to walk with ease, (*Exam. de plus. Part. de la Chir.*, t. II., p. 441, 1757.) A fracture of the leg, complicated through the imprudence of the patient, with a wound and subsequent displacements, obliged Estor, the father, (*Observation communiquée par Estor même à M. Champion*) to exsect the portion of the tibia which was denuded. At a later period, the epiphysis separated, and was extracted. M. A. Cooper (*Œuvres Chirurg.*, t. II., p. 149) mentions a case of this kind, in which the consolidation of the tibia did not take place, though the fibula remained sound. A similar fact was related to him by Smith.

Josse (*Bull. de la Fac. de Méd. de Paris*, No 9, p. 309, 1819,) who

exsected two inches of the right tibia which had been completely denuded, says his patient preserved the movements of his foot. The tibia in a case being fractured obliquely below its lower third, protruded to considerable extent through the skin; fruitless efforts were made at reduction, and the soft parts were threatened with gangrene from the pressure of the tibia upon them. An inch and a half of the bone was exsected, and the splinters extracted by M. Maunoir, (*Observations communiquée à M. Champion par l'Auteur*. The cure, after some inflammatory accidents, was effected in four months. M. Josse (*Mél. de Chir. Prat.*, p. 321, obs. 29) says, his father, in a case, performed exsection upon the tibia, *because the fracture had not yet united, after the expiration of two months and a half, and because the operator was satisfied that nature herself would not effect the union*. Five weeks after the exsection of two inches of the bone, the consolidation was complete.

A fine opportunity of exsecting the tibia escaped M. Champion. There was a fracture of the tibia and protrusion through the skin. The health officer of the place merely applied a simple dressing. M. Champion being sent for to the village, saw the young and unfortunate woman, twenty-two days after the accident. The tibia which had been fractured in its lower fourth, had descended down to a line with the plantar surface of the foot, forming a protrusion of four fingers' breadth, which was covered throughout the whole of this extent with fleshy granulations formed upon its surface. Exsection proposed and agreed to for the following day, was not performed, because the officer of health threatened the family to withhold all assistance from them for ever, if the operation was performed!

C. *Exsection of the two Bones*.—A man had his right leg fractured transversely at five fingers' breadth above the tibio-tarsal articulation. The ends of the bones protruded more than two inches, and their reduction could not be effected by several physicians and surgeons who had attempted it. They were about amputating the limb in the solution of continuity itself. Rossius being sent for, remarked that the foot was sound, and that everything else should be tried before proceeding to that extremity, and that they should begin by removing the portions of the bone that were denuded of periosteum. After having excised the projecting extremities by means of a saw with very fine teeth, Rossius replaced the bones by making a moderate degree of extension, and kept them in place by a suitable bandage. The intense pains which the patient had suffered, subsided, some exfoliations took place, and at the end of two months the wound was closed. At the fourth month the patient could walk. When Rossius (*Consult. et Observ. Salut.*, p. 93, 1608) met him in town, the man ran up to him, and expressed towards him the most lively sense of respect and gratitude.

Though this case was published only in 1608, by Victor Rossius, the son of the operator, this operation had been performed a long time before, as one of the posthumous operations bears the date of 1580.

Bilguer, (*Opér. cit.*, p. 25, § 36,) who speaks of a case where the fragments formed a mass of three layers at the lower part of the leg, says that by means of deep incisions, and the exsection of the two bones, a perfect cure was effected. In 1776, a man fractured his leg in the lower third by falling from a horse. The two bones plunged into



the ground to the extent of three fingers' breadth. The first dressing was wretched, and left the bones protruding out, and denuded. On the fifth day, the Percys, the father and the son, were sent for, (*Observation communiquée par Percy à M. Champion.*) They performed exsection of the portion in excess from the upper extremities of the fractured bones. Perfect consolidation took place in two months, with a shortening of twenty lines.

*D. Operative Process.*—If it is the fibula which is fractured, the eversion of the fragments outwards and forwards, almost always allows of our crowding the lateral peroneal muscles backwards, and the anterior muscles of the leg inwards. Though there are no large-sized arteries nor nerves in the neighborhood, we must, nevertheless, raise up each fragment, and keep it so by means of a piece of pasteboard, &c., glided under it, while with the saw directed obliquely, we exsect the upper fragment from above downwards, and the lower one from below upwards.

In the case of fracture of the tibia, the operation is usually more tedious. This bone, besides being in itself much thicker, and in the neighborhood of the anterior and posterior tibial arteries, is also sometimes difficult to turn into the direction which is most suitable. We should not, therefore, spare our incisions into the skin, when we are about to exsect it. As the fibula, however, possesses a certain degree of flexibility, we may, by acting on the foot, which is to be inclined backwards, outwards, or forwards, according as is required, give ourselves in most cases considerable room, and bring into view, without much difficulty, that portion of the bone which we wish to remove. Though it will almost always suffice to exsect the protruding portion of the upper fragment, we are not, however, to respect the lower one if it should project out too far, and if we can reach it without too much difficulty. Oblique fractures of the tibia so rarely recover without deformities, and so often leave under the skin, after their consolidation, a point or crest which gives occasion to incessant trouble to the patient, that we ought never to hesitate to remove the projecting portions so often as they are complicated with wounds.

As with the fore-arm and arm, so after exsection of the bones of the leg in cases of fracture, the starch bandage is an invaluable resource; and, as with the thoracic extremity, so is it equally necessary here that openings should be left in this dressing opposite to each one of the wounds.

### § VII.—*Exsection of the Femur.*

We already find in Paré (Liv. II., chap. 5.; Bagieu, t. II., p. 509) the case of a M. de Croy, who, having had the splinters which were in his thigh removed, got well of a fracture of the femur, with the exception of a slight defect only in the movements of the knee. An officer of sixteen years of age, had both femurs fractured; the right one was shattered to the extent of about four inches; the lower fragment resembled a fork; the upper fragment, in spite of what was broken off from it, and the five pieces that were taken from it through the wound, rode so strongly on the other, that its reduction was impossible. Am-

putation would have been performed, had not Lauquine (*Journal de Verduin*, Avril, 1733, p. 97, 240) found on the fore-part of the upper fragment a fissure which penetrated into the medullary canal, and extended upwards to five or six fingers' breadth from the hip, a little below the great trochanter. The fever and diarrhœa exhausted the patient. On the twenty-eighth day the wound was dilated, and the upper fragment sawed up to above the fissure. The portion sawed off, and those extracted, comprised *nine inches* of the body of the femur, leaving only about ten to twelve fingers' breadth of this bone remaining. The accidents ceased; on the third day permanent extension was made, and a fracture box adjusted for the lodgment of the limb. The cure was effected in seven months, with a shortening of *two inches*. The patient could walk with firmness. Exsection, also, had to be performed in the two following cases:—Fractures of the two femurs; protrusion of the lower fragment through the flesh in a negro boy of twelve to thirteen years of age, attacked with tetanus. Reduction was in vain attempted by the surgeon Philibert, (Poupée-des-Portes, *Mal. de St. Dom.*, Obs. 2c, 1770.) A containing bandage was applied for 24 hours. At this period, an end of bone about an inch long was extracted. Some days after, the same thing was done on the other thigh, with this difference, that the portion of bone which protruded had at least three inches length. After the extraction of the sequestrum, the muscles seemed more pliant; Philibert could now return the feet from without inwards, and place them in their natural position. The cure was complete. The negro did not limp; the thighs were only a little arched in their upper portions, which made him walk too spreading. On the upper and outer lateral part, there was still felt near the great trochanter on each side, a rough and irregular swelling or slope.

*Operative Process.*—To exsect the femur in cases of fracture, it is absolutely necessary to make the fragments protrude either in front or outwards. We begin with the upper fragment first. An assistant grasps the side of the upper part of the thigh. A second assistant supports the leg and the knee, which he inclines in an opposite direction. After having sufficiently liberated and isolated the organs, and placed a protecting body between the bone and the soft parts, the surgeon grasps the point of the fragment with his left hand in order to exsect with the saw placed in his right. Proceeding, afterwards, to the removal of the end of the lower fragment, he operates precisely in the same manner. At the upper third of the thigh, however, it would be more convenient to begin by exsecting the lower fragment, seeing that the upper one tends to conceal itself on the inside or in front, while the point of the other projects outwardly. The starch dressing here also co-operates as a containing bandage, in the success of the operation after the exsection.

#### § VIII.—Other Cases.

The *immediate* exsection of the ends of bone protruded through the flesh is not always possible though indicated, as for example in the *intra-uterine* fœtus. The tibia was separated from its lower epiphysis in an infant of six months' pregnancy. At birth the upper fragment

passed through the skin in a direction outwardly. It had lost its periosteum and presented a bad aspect. Attempts at reduction were abandoned because the borders of the wound were attacked with gangrene, and that necrosis had begun to make its appearance. The disease rapidly extended, and death took place on the thirteenth day, (Carus, *Arch. Méd.*, t. XVI., p. 444.) Would not exsection have saved this infant?

M. Schubert (*Jour. des Progrès*, t. VII., p. 247) speaks of an infant born at its full term, and whose left thigh, fractured and carious, protruded through the flesh to the extent of more than an inch. In the case of an oblique fracture of the bones of the leg in a foetus, the pointed extremity of the fragment of the tibia pierced through the skin. The two bones, moreover, were adherent at their fractured extremity, so that they formed a large surface, (*Jour. de Hufel.*, &c., *Jour. Comp.* t. XXVIII., p. 330.) Exsection would also be advisable if one of the ends of bone, caught in the medullary canal of the other, should occasion accidents and could be diagnosticated. J. L. Petit ascertained on the dead body that one of the ends of the femur had caught in the medullary canal of the other, that consolidation had taken place, and that the limb was lengthened near an inch. M. Roux (*Malad. des Os*, edit. de Lorus) also in a case of fracture, in order after exsection to keep the ends of the bones united to each other, effected the invagination of the lower end of the humerus into the medullary canal of the upper fragment, without its being followed by any unpleasant consequences. A fall on the arm, however, at the expiration of two months, marred the success of this operation.

### § IX.—*Bones of the Pelvis.*

The cases that might require exsection in fractures of the pelvis are not by any means rare. In the case of a boy aged fifteen years, who had been crushed against a stone butt by the wheel of a diligence, I was obliged to exsect an inch of the right pubis which protruded through the skin. I was obliged, also, in a man whose pelvis had been fractured by a carriage, to remove the whole of the tuberosity of the ischium; and I have frequently removed an inch or two of the crest of the ilium in consequence of similar injuries. It is rare, however, that the operation will succeed in this region, because the internal organs are injured to such extent as to leave no hope of preserving life. I have, however, seen two individuals recover after the excision of the upper border and anterior spinous process of the ilium.

### ARTICLE II.—NON-CONSOLIDATED (*i. e.*, UNUNITED) FRACTURES.

Sometimes in fractures consolidation will not take place. The two ends of the bone become rounded off, and an abnormal joint is formed in the continuity of the limb which almost totally destroys its functions. Some authors, in order to remedy this accident, have proposed to place the limb in a state of complete immobility, and to employ certain kinds of apparatus for a great length of time. Others have supposed that it would be better to pass a seton through this species of morbid articula-



tion. Others again confine themselves to producing friction of the ends of the bone against each other in order to create inflammation. Sommé has succeeded by passing a silver thread around the intermediary substance of the joint so as gradually to effect its division. M. Harts-horne has been equally fortunate in destroying it by caustic potash also introduced upon the extremities of the fragments. But in such cases, exsection is, as we shall see, the resource which offers the best chances of success. White, who attempted it first in 1760, in a case of non-consolidated fracture of the humerus, in which he brought the two ends out and sawed them off, and in another case afterwards in the tibia where he confined himself to exsection of the upper end, obtained perfect cures in both his patients. M. Viguerie and M. Langenbeck have met with similar good fortune in fractures of the arm by following the method of White. Dupuytren confines himself to exsection of the upper end, and to rasping the other. Bowlans, M. Pezerat, &c., have also performed this exsection with success in ununited fractures of the thigh. Some other surgeons have not been so fortunate; MM. Larrey, Rich-erand, Boyer and Physick, relate cases where it has been followed by serious accidents and even by death. So that we should not decide upon it until after mature reflection, and after having satisfactorily ascertained that the operation is necessary; so much the more so, as the difficulty for which we perform this operation is sometimes reduced to an infirmity which can be supported by the patient. In the thesis of M. Caron, we have an instance of a man who had one of these fractures in the thigh, and who could walk without crutches. In the patient of M. Kulnholtz, (*Journal Compl. des Sc. Méd.*, t. III.) the false articulation was complete and scarcely affected the functions of the limb. M. Cloquet (*Arch. Gén. de Méd.*, t. XIX., p. 619) mentions a case in which the upper fourth of the humerus had been for a long time destroyed, but without impeding thereby the motions of the arm. M. Yvan (*Ib.*) relates a similar case of the thigh. M. Troschel (*Journal des Progrès*, t. X., p. 257) mentions three cases of this kind who were enabled to walk with ease by using the double gutter of tin, constructed by the manufacturer Baillif. I have myself seen at the Central Bureau a woman with one of these fractures in the right thigh, and who is enabled to walk without crutches by means of an apparatus, though of a very rude construction. Analogous facts are referred under the head of *Deformity from Diseases of the Bones*, (Vol. I.) The surgical treatment therefore of false articulations is exceedingly complex, and requires to be examined in all its parts considered separately.

[*Effect of Utero-gestation in Fractures.* Among the causes which may retard or prevent consolidation is the state of pregnancy. Every one is familiar with the fact that pregnant women are peculiarly prone to fractures; but a case is related, (*Provincial Medical Journal*, (Eng.) Sept. 3, 1842—see also Cormack's *London and Edinburgh Monthly Jour.*, &c., Feb., 1843, p. 160,) in which a woman, a native of the West Indies, had fractured both bones of the right leg near the middle, Sept. 23, 1839, in the eighth month of her pregnancy. No pain or action supervened in the part, nor any union, the interval between the fractured surfaces being occupied by a pulpy substance, until a few days after, Sept. 28, when the mother having had a comfortable labor, the

work of ossific reparation now commenced, accompanied with pain, and effected a complete cure by January succeeding. The narrator of the case, Mr. H. R. Oswald, considers that the completion of the child was the cause of non-deposition of earthy matter in the mother's leg. If that were true, why, when this process of building up the child's bones and tissues is in such active operation as it is during utero-gestation, should there actually be an apparently disproportionate preponderance of earthy over gelatinous matter in the bones of the mother? for, as in this case, it is precisely then that the bones are most brittle, *i. e.*, surcharged with phosphate of lime, and the reverse of mollities ossium or a preterabundance of animal glue, &c. The more probable fact is, that if observation were attentively directed to this process it would be found that fractures more frequently happen to the mother in the earlier months of pregnancy, when more glutinous matter is required for the fœtus and the mother's own osseous system therefore probably called upon occasionally by the absorbents for a supply of this material. Hence the brittleness then of her bones from too great a proportion of earthy matter. The suspension of any new reparative action whatever in the mother during utero-gestation is readily conceived of as a physiological result quite natural and possible. T.]

#### § I.—Friction (or rubbing) of the Fragments.

A fracture will sometimes fail to unite because it is in want of the degree of stimulation requisite for the production of the callus. The limb then appears shrunk and enfeebled, and in some cases assumes the aspect of organs affected with what M. J. Cloquet (*Archiv. Gén. de Méd.*, t. I., p. 470) has described under the name of *Local Scorbutus*. Among the patients whom I have seen in this state, there were many of them who were young and robust subjects. The usual causes of this condition are want of exercise, and the compression of the blood between the fragments. Time, the removal of all dressing, and a nutritive (substantial) diet, and some frictions to the ends of the bones, generally suffice to bring about a cure. Like Earle and M. S. Cooper, I have also noticed in such cases, that by leaving the limb without dressing, the consolidation will often ultimately take place of itself; whether the stimulus of necessity augments the activity of the ossific process, as Hunter, (*Trans.*, t. XII., *et Mém. Chir.*, etc., t. I., p. 383; S. Cooper, *Dict. Chir.*, t. I., p. 480, coll. 2,) expresses it, or that relieved from all kind of uneasiness and pressure, the parts immediately become the seat of a more active nutrition, or that the slight rubbing together of the ends of the fragments, against each other, caused by the muscular movements, create the degree of irritation which the callus stands in need of.

If this repose and the absence of dressing continued for a length of time do not answer, we can then have recourse to actual frictions. In the lower extremities we first endeavor to effect these by the action of walking. Ch. White (*Cases in Surgery with Remarks*, p. 73) cured a fracture of the thigh by means of a cuish and the exercise of the limb. In a case of fracture of the leg at the lower part, and which had not consolidated after two months and a half of treatment, I effected a perfect cure by making the patient walk by means of crutches. I was

led to this practice, says M. Champion, by the emaciation of the limb caused by the pressure of the dressing. The same practitioner also adds that M. Jacquier of Ervy, promptly cured a fracture of the tibia by making his patient walk. It is a practice which I often follow at La Charité and I find it answer very well.

Direct friction, which was already in use at the time of Celsus, (*De Re Med.*, lib. VIII., cap. 10, sec. 9,) has often been made trial of since. Though Borm, (A. Bérard, p. 43, *Thèse*, 1833,) Germain, (*Procès-Verbal de la Soc. des Sciences de Liège*, p. 57, 1773,) M. Hain, (*Vallet, Non-consolid. des Fract.*, Strasbourg, 1817.) Ansiaux (*Clin. Chir.*, p. 323, 2d ed.) and others may have seen it fail; Derecagnaux, (in the leg, *Journal de Corvisart*, an IX., p. 314,) MM. Vogel, (In the clavicle, *Diss. Medico-Chirurgicale*, sur le Seton, p. 11, Strasbourg, 1815. The cure attempted in the sixth week by a surgeon-major.) Parrish, (*Arch. Gén. de Méd.*, 2e série, t. VI., p. 569,) Base Dow, (*Graefe und Walther, Journal*, t. XVII., p. 438,) Sanson, (*Dict. de Méd. et de Chir. Prat.*, t. II. p. 508,) and Delpech, (*Clin. Chir.*, t. I., p. 250, 1823,) have related instances of its success. It is a resource, therefore, that may be made trial of in spite of the sort of anathema fulminated against it by Boyer, (*Malad. Chir.*, t. III., p. 106.) The skin being unaffected, the fragments, when rubbed against each other, will not produce any serious accidents, nor lead to the formation of abscesses, unless they are moved without skill or method. Before proceeding in such cases to an actual operation, I would, instead of the small blisters eulogized by Walker, (*Journal de la Soc. de Médecine*. A. Béclard, *Thèse*, p. 43,) willingly apply a temporary blister.—(See Vol. I.) large enough to envelop the whole contour of the fracture.

## § II.—Compression, Immovable Dressing.

If the pseudarthrosis, in place of being kept up by the shrinking and feebleness of the limb, appears to depend upon an excess of irritation or tumefaction, it is then possible that the compression which M. Wright (*Jour. des Progr.*, t. XV., p. 88,) says he has found so advantageous, may in fact be found serviceable. Nevertheless, I can scarcely understand, nor are M. Wright's observations calculated to demonstrate, how this alone can cure a false articulation. The cures which are imputed to it, depended probably upon a more complete state of immobility having been given to the limb, than had hitherto been attained up to that time. To effect that object we must have recourse to the starch bandage. This last resource must be made trial of before all others, and offers real chances of success, in cases where during the treatment we have never had it in our power to subject the non-united fracture to a state of perfect immobility. Science possesses on this subject facts that are already numerous and conclusive. Non-consolidated fractures of the thigh and arm, and of the leg and fore-arm, have been cured by means of the starch bandage, by M. Larrey, M. Bérard, jun., and M. Macdowel, (*Jour. des Connaiss. Médic.*, t. II., p. 123.) A patient whose fore-arm, by the advice of Rust (*Journ. des Progrès*, t. X., p. 259,) had been enveloped in Baillif's machine, solely with the view of rendering the false articulation less annoying, was astonished to find



himself cured at the expiration of three months when he was about to renew the dressing. A woman who had had a false joint for more than a year, was cured in two months by M. Thierry, (*Expériences*, t. I.,) by the application of the starch bandage. Having been in the employment of this bandage since the year 1836, I have satisfied myself that it enables us to cure without any other operation, the great majority of those false articulations which succeed to fractures. A woman aged thirty-nine years, who already had a non-consolidated fracture of the thigh, broke her arm. The ordinary dressings were made use of for two months, without any benefit. I then applied the dextrine bandage, and the consolidation was effected completely. Mdme B \* \* \*, whose humerus had been fractured thirty months before, and continued movable, notwithstanding the treatment of many distinguished surgeons of the capital, and the employment of all sorts of bandages, made up her mind, in May, 1838, to make trial also of the dextrine bandage. A roller bandage was placed naked over the whole extent of the limb and fastened by a spica around the chest. Over this were then placed two layers of turns of bandage with pieces of pasteboard saturated with dextrine; the whole soon becoming dry was left without being disturbed for the space of two months, when at the expiration of this period, to the great surprise of this patient, who no longer looked forward to a recovery, the fracture was found consolidated upon my removal of the bandage. The same thing occurred in a pseudarthrosis of the thigh of ten months standing, and of which I have already spoken under the chapter on Deformities, (Vol. I.)

By means of this bandage therefore, properly applied, we may count upon the cure of all those false articulations, which are not the result of a want of excitation or of general disease, or a degeneration of the fragments, but which have been brought about by the defect of the means to be employed to produce proper compression. It ought also to be classed under the head of the auxiliary means, or fracture apparatus, to be used after the different varieties of operations of which I am now about to speak.

### § III.—*The Seton.*

The seton which was used to the fore-arm without a successful result, by Cittadini, who proceeded afterwards to the exsection of the ulna; and to the humerus in a case related by Lombard (*Thèse* No. 377, Paris, 1814;) again to the humerus, by Earle (*Trans. Med.-Chir.*, t. XII., *et Mémoires de Chir. Etrang.*, t. I., p. 376,) who substituted potash for it without any better success, effected its purpose but imperfectly when applied to the femur in a patient of M. Brodie (*Journal Analyt. de Méd.*, t. I., p. 277, 1827,) and to the patient mentioned by M. Wardrop (*Mém de Chir. Etrang.*, t. I., p. 350.) Béclard (*Vallet*, p. 25,) of Strasbourg, also only obtained partial success from it in using it to the humerus; while Ansiaux and M. McDowell (*Journ. des Conn. Méd.*, t. II., p. 123,) in similar cases failed with it completely. It is a resource nevertheless deserving of commendation in all sort of fractures. Thus Rigal de Gaillac (*Société Méd de Montpellier*, Juin, 1812,) by this means cured an ancient fracture of the leg. A similar cure was

obtained by M. Mott (New York *Medical and Surgical Register*, Vol. II., p. 374,) and another has been published by M. Browne (*Bulletin de Férussac*, t. XXI., p. 268.) Hornier (1812—*Vallet*, p. 24,) succeeded with this operation upon the humerus. Delpech (*Clin. Chir.*, t. I., p. 255,) effected a cure by this means in the fore-arm, 86 days after the fracture, and M. Ducahet (Bérard, *Thèse*, etc., p. 46,) at the expiration of ten months. A false articulation with a fibrous exudation had been formed, while there existed at the same time an abscess in the calf. By means of a tunnel-shaped wound, M. Weinhold (*Bull de Férussac*, t. XI., p. 66, 1827,) introduced a conical formed seton into the false articulation, and cured his patient. A pseudarthrosis which had existed in the right femur for ten years, accompanied with fistulas and caries, was cured by the same means in the space of three months, and it succeeded equally well also in another case of false articulation of the femur treated by M. Pl. Portal, (*Encyclograph. Méd.*, 1836, p. 311.) Non-consolidated fractures of the humerus have been cured by means of the seton by Physick, (A. Bérard, *Opér. cit.*, p. 45,) Percy, (Laroché, *Thèse*, Paris, 1805,) Dohldorf, (*The Lancet*, 1829, Vol. II., p. 105.) Stanfield, (Bérard, p. 45,) Pl. Portal, (*Encyclograph.*, 1836, p. 311,) and M. McDowel (*Journ. des Conn. Méd.*, t. II., p. 123.) Physick also is of opinion that he cured in this manner a fracture of the jaw, which had existed for two years. It is nevertheless a very uncertain means, and one for which I should prefer to substitute exsection, where frictions and the starch bandage had not answered, and it is one moreover which is not always unattended with danger. M. Weinhold in applying it to the neck of the femur brought on caries and suppuration in the cotyloid cavity and pelvis, which ended in the death of his patient. M. Harris, (*Arch Gén de Méd.*, 2e sér., t. X., p. 220, 217,) however, states, that in using it to the fore-arm in one case after exsection, and to the humerus in another, he effected a cure in both. M. Viriel (Montfaleon, *Mém. sur l'Etat Actuel de la Chir.*, 1816, p. 195,) after having abraded the osseous surfaces with a file, introduced a seton according to the mode of Physick. The greatest care bestowed upon the patient could not save the patient from death. He died a few days after the operation. M. Scerig (*Encyclogr. des Sc. Méd.*, 1838, p. 33,) who succeeded with the seton in one case, was obliged to resort to exsection, and in a second case lost his patient.

#### § IV.—*Caustics and Rasping.*

Earle, after having rasped the humerus, applied caustic potash to the bottom of the fracture, (*Méd.-Chir. Trans.*, t. XII., and *Méd.-Chir. Trans.*, t. I., p. 384.) There was no exfoliation took place, nor was there any reparative action established.

M. Hewson, (*Journ. des Progrès*, t. IX., p. 170,) by excising the ligamentous tissues, and cauterizing in the same manner, effected a cure of a false joint in the leg. M. Lehmann (Bérard, *Thèse*, p. 42) succeeded equally well by applying butter of antimony to the tibia. M. Hulse (*Gaz. Méd.*, 1834, p. 246) asserts that he has succeeded equally well by using simple irritating injections, and M. Mayor (*Nouveau Syst. de Délég.*, p. 168, art. 2) procured the consolidation of a fracture of the

femur, by introducing upon it through a canula, a punch heated to the temperature of boiling water. M. Hartshorne also asserts, (A. Bérard, *Thèse*, p. 41,) that the application of caustic upon the skin is sufficient to ensure success. But all such remedies are inferior to the seton. According to (Verduc, *Path.*, t. I., p. 412,) the cauterization by means of sulphuric acid, of a callus, mistaken for a fungus, caused the death of the patient in six months. M. Barthélemy, (*Diss. de Montpellier*, et Vallet, p. 31, who describes the instrument,) who, in 1814, proposed a *grater* in form of a saw, to be passed through a canula to the fragments, in order to scrape the ends of the bones, would incur the same danger. A case of fracture had existed in the radius for the space of a year. An incision was then made down upon the bone. Edfond (*Journal de Simmons*, trad. par Masuyer, t. I., p. 405) then divided the periosteum, and removed it to the extent of an inch above and below the fracture, without disturbing the fragments. Inflammation and consolidation succeeded, and the patient was perfectly cured at the expiration of three months.

[*Acupuncturation for Ununited Fractures*.—M. Weisel (See *Medical Times*, Jan. 11, 1845) cured an ununited fracture of both bones of the fore-arm, by *acupuncturation* with two long needles, first passed through the arm between the fragments of the ulua, and left in five days till acute inflammation was produced; and secondly repeating the same operation in 15 days after, between the fragments of the radius. T.]

### § V.—*Exsection*.

A. Exsection, however much lauded and practised by an infinite number of surgeons, in cases of ununited fractures, is, nevertheless, still censured by M. Gouraud, (*Elémens des Prin. Opér.*, p. 164,) who considers it a retrograde movement in surgery. Sometimes, in fact, it becomes a very serious operation. In a case of exsection of the two ends of a femur, communicated by M. Gable to M. Vallet, (Vallet, *Thèse*, p. 29,) it was barbarous, and lasted over an hour; the patient, a young and vigorous man, had convulsions, and died in the evening. Though Callissen (*S. Cooper*, t. I., p. 478, et suiv.) relates two examples of success, Cline (*Ibid.*, p. 482) states that with him the operation had failed. The patient upon whom M. Langenbeck succeeded, had a false articulation of the humerus. It was the same with that of M. Rodgers, (*Rust's Handbuch der Chir.*, p. 541,) and that also of M. Fricke, (*Gaz. Méd. de Paris*, 1787, p. 155.) M. Dupont (*Arch. Gén.*, t. II., p. 628) was not less fortunate in a similar case, and M. Liston (*Edinburgh Medical and Surgical Journal*, Vol. LX., p. 317) also cured his patient. But in a multitude of other examples, serious accidents have supervened, or the result of the operation has been unsuccessful. A patient operated upon by Boyer, (*Boyer*, t. III., p. 111,) died from gangrene of the arm. Dupuytren lost one of his in consequence of inflammatory symptoms, (Bérard, *Thèse*, p. 52.) Another patient (*Gaz. Méd. de Paris*, 1831, p. 289) still retained his false articulation four months after the operation. The young man operated upon by M. Hewson, (*Arch. Gén. de Méd.*, 2e sér., t. X., p. 225,) died from purulent infection. Though Andrew (*Journ. de Méd.*, par Simmons, 3e part., 4e sect., t. I., 1781,)



communicated to Hunter, the details of a remarkable operation of this kind, which he performed with success upon a fractured arm, and though Physick (*Medical Repository*, of New-York, t. VII., p. 122, 1804) was witness to a similar success, we see that in the patient of Rossi, (*Elém. de Méd. Opér.*, t. II., p. 190,) a ball was found in the fragment above the part exsected, and that it became necessary to resort to amputation; and that in the case of Ansiaux, (*Clin. Chir.*, p. 323, 2e édit., 1829,) frietion, the seton, and excision all proved unavailing. Nor was M. Moreau (Champion, *Thèse de Paris*, 1815, No. 11, p. 51) more fortunate. But this process applied to the tibia by White, (*Cases in Surgery*, p. 81—84, 1770,) M. Harris, (*Arch. Gén.*, 2e sér., t. X., p. 215,) and A. Dubois, (Foussard, *Dissert. sur les Fractures*, p. 41,) has succeeded very well.

In a case of pseudarthrosis of both bones of the fore-arm, Cittadini (*Journ. Complém.*, t. XXXII., p. 157) was enabled to effect a cure by exsecting the ulna only. MM. Fricke, (*Ibid.*,) Holscher, (*Dict. de Chir.*, de Rust,) and Inglis, (*Edinburgh Medical and Surgical Journal*, Vol. LX., p. 317,) have been equally fortunate with M. Cittadini, in non-consolidated fractures of the same portion of the limb. But with M. Warmuth, (*Dict. de Rust*, p. 544,) and M. Harris, (*Arch. Gén. de Méd.*, 2e sér. t. X., p. 217,) this exsection failed. Another surgeon (*Mém. Acad. Chir.*, t. X., p. 84, in 12mo; t. IV. p. 626, in 4to,) sawed off more than a finger's breadth of the lower end of the femur, and cured his patient. Dupuytren (Sabatier, *Méd. Opér.*, t. IV., p. 461, édit. Bégin,) and Moreau, the younger, (Champion, *Traité de la Résection*, etc., p. 67, 1815, &c., et Moreau, *Essai sur l'Emploi de la Résection des Os*, p. 72,) also succeeded upon the femur.

The operation on the femur succeeded also with M. Viguerie, (S. Cooper, *Dict. de Chir.*, t. I., p. 481,) M. Pézerat, (*Jour. Compl.*, t. V., p. 111,) with Dupuytren, who gives two examples of it, (Bérard, *Thèse*, p. 51,) and with M. Mott, who had recourse to it when the seton to which he gives the preference, and with which he has succeeded in three instances, proved insufficient; but we have seen farther above that this exsection has frequently failed. The patient of M. Harris (*Arch. Gén.*, 2e sér., t. X., p. 215) did not recover until after eight or nine attacks of erysipelas, and a year's treatment, while that of M. Hewson (*Ibid.*, p. 225) died on the sixteenth day.

This operation performed also by Halgout (*Essai sur l'Amput. des Membres*, par Lambert, Paris, 1815,) of Boulogne, in presence of Percy, in the year 1803, for a fracture of five years' standing, by making a long incision on the outer side of the limb, also failed. Death, preceded by fever and suffocation, and without any action of consolidation, took place at the end of a month. Before the operation the patient could walk only by the aid of crutches, and the thigh seemed to be held only by the skin.

In a case of non-united fracture of the patella which had existed a month, it was the intention of M. A. Séverin, (*Corps de Méd.*, etc., de Bonet, t. I., § 953,) had the patient consented, to have pared and abraded the edges of the fracture, before *tying them tightly* together against each other. M. A. Séverin calls this operation harsh and difficult! Should the pseudarthrosis be accompanied with a sequestrum

and necrosed splinters between the fragments, we may confine ourselves to removing them, taking care at the same time to avoid the other portions of the bones. Faivre gives an example of this upon the leg (*Ancien Journ. Méd.* t. LXVIII., p. 210;) the fracture had existed 7 months, and suppuration had taken place; some splinters, and one portion of the whole thickness of the bone of an inch and a half in diameter, were extracted; the parts were then cauterized with the hot iron, and the cure thus effected.

Here is another case: A man had the humerus on the right side fractured into splinters on its lower third by the discharge of a leaden ball, which penetrated on the inner side of the arm. Three splinters of bone were extracted, which came from the inner and posterior portion; after some days had elapsed, splints were applied. The surgeon consulted 4 months after, found a sinuous wound, a number of sequestra and a sufficient degree of mobility at the place of the fracture. Having laid open the fistula above and below, he extracted several pieces corresponding to the inner and anterior surface of the humerus, to an extent of sixteen lines. The finger could enter the medullary canal of the two ends of the bone, and bring away marrow in a state of dissolution. A sort of provisional or temporary callus, which had already formed in front and on the outer side, though the arm was flexible, gave assurance of a perfect consolidation in a short space of time.

[A most remarkable case of pseudarthrosis was subjected to this operation by Mr. Bowman, of King's College Hospital, London. So great was the deformity, that when the patient attempted to bear his weight, the fragments were so pressed downwards that the under one was bent forwards on the dorsum of the foot, and the end of the upper fragment actually rested on this part. The resection overcame the deformity, but at the last report, union was regarded as very improbable, (*vid.* Fergusson's *Pract. Surgery*, p. 478.) Mr. F. thus records his experience in this operation. "I have seen resection of the ends of the fragments in three instances. One of the cases, was in my own practice and was unsuccessful, the patient having died unexpectedly some weeks after, when the wound was all but healed. The other occurred to my colleague, Mr. Partridge, and was successful in all respects. The third occurred with Mr. Gay, of the Royal Free Hospital, and answered no good purpose in the end, (*op. cit.* p. 479.)

The resection of the ends of the bones failed in the instance in which it was performed by Dr. Henry H. Smith of Philadelphia. Dr. J. Kearney Rodgers reported in the *N. Y. Med. & Phys. Journal*, vol. VI. 1827, a case of ununited fracture of the humerus, which was successfully treated by resection after failure of the seton. In the *Amer. Journ. Med. Sciences*, vol. XVII. N. S. 1849, Dr. Brainard, of Chicago, has given the particulars of a case of ununited fracture of the femur cured by resection, denudation, and retaining the ends of bone by means of wire. G. C. B.]

*B. Appreciation.*—We see from the example which Science is already in possession of what we have to hope for in practice from excision of the bones in cases of ununited fractures. Wherever the pseudarthrosis is sustained by some constitutional disease in the individual, the operation will be unattended with success. There will be a

chance of success on the contrary when there is an hydatidic affection of one of the bones, of which Dupuytren has met with an example (*Journ. Hebt.*, t. XII., p. 97,) or where some carious or necrosed point of the extremity of the fragments, is the only impediment to the formation of the callus. It would also be the only efficacious resource in an ancient oblique fracture, where the point of one of the extremities of the bone, had become imprisoned in the thickness of the muscles, as happened in the patient of M. Earle, (S. Cooper, *Dict. de Chir.*,) in one of those of Dupuytren, in that of Boyer, and as it would seem in that also of M. Pézerat. If the fracture, whatsoever may have been the primitive cause, shall have become reduced to an affection altogether local, and shall have not united purely because its two fragments have cicatrized separately, then also is exsection still the most efficacious remedy. Nevertheless, we should never decide upon this step until we have maturely considered all its dangers. Being under the necessity of penetrating into the centre of the limbs, and of detaching and dissecting the muscular tissues to a very considerable extent, we transform the infirmity into a fresh compound fracture with a deep wound. From whence the danger of suppurations, erysipelas, inflammations of all kinds, caries, necrosis, and even purulent infection of phlebitis, as is proved by the facts collected by M. Kirkbridge, (*American Journal of Medical and Surgical Science*, November, 1835,) and those of M. Troschel, (*Encyclograph. des Sc. Méd.*, p. 33.)

C. *Operative Process.*—The difficulties of the operative process in exsection of the bones in cases of false articulations, are very different in different parts of the limbs.

I. *Bones of the Fore-Arm.*—If the pseudarthrosis should be situated in only one of the bones of the fore-arm it would be unnecessary to perform exsection. When this operation is indicated, there is at first an arrangement in the limb which allows of its being easily inclined in one or another direction. It is unnecessary to add, that where there are wounds or fistulas connected with the fracture, we should, in order to reach the bone, confine ourselves to their dilatation, unless they should be too unfavorably placed for our doing so. In the contrary case, which will be found the most common, we should make an incision upon the integuments on the most superficial surface of the ulna or radius. The bistoury, therefore, should be applied upon the posterior and inner side of the fore-arm for the first of these bones, and to the outer and slightly to the posterior side for the second. This incision, whose middle should correspond to the fractured part of the bone, ought to have an extent of two to three inches. In order to detach gently all the soft parts which adhere to the bone within and without, the surgeon places the arm in a state of flexion, and thus brings out to the external surface the two ends of bones to be exsected. If there is found to exist between them a solid bridle, we can, after having detached the soft parts from them, easily glide underneath a small splint, which will serve as a support, while we in the mean time successively remove, with the saw, the two portions of osteo-ligamentous substance. The same operation having been performed upon the radius, where a little more precaution is necessary, to avoid the artery and tendons of the thumb, the limb, after having arrested the hemorrhage and cleansed the wound,



is straightened and placed in an immovable bandage and then dressed in the same manner as if it was a recent fracture.

II. *Humerus*.—If the fracture of the arm should be situated upon its middle portion, the incision should by preference be made on the outer side of the limb; in which place it would implicate only the integuments, cellular tissue, aponeurosis, and a few branches of nerves. The cephalic vein, besides, could be easily pushed aside. At the lower fourth of the humerus, however, we should have to be on our guard against the radial nerve. In order to divest the points of bone of the tissues which adhere to them, it would be necessary to graze very close, and not to come too much in front, for fear of wounding the brachial artery and median and ulnar nerves.

If the fracture should be situated near the elbow, it would be better to make the incision on the posterior surface, taking care not to go down as low as the synovial cavity, but to prolong the cut a little more above. If the longitudinal division of the triceps should not suffice, there would be little danger in uniting to it a transverse incision on one or both sides of it. If, in bending the arm on its anterior face, there should be more difficulty in making one of the fragments protrude than the other, it would be prudent first to exsect that which presents itself and to dissect and saw the other afterwards, after having brought it out by means of a hook, or lever, or the fingers.

In the upper fourth of the humerus, a false articulation could be reached only through the deltoid muscle. It is in this place that the operation might be exceedingly embarrassing, and attended with real dangers. Dupuytren, (*Gaz. Méd.*, 1831, p. 289,) in making an incision of six inches for an affection of this kind, encountered serious difficulties. Accidents supervened, and four months after, the false articulation was still there.

III. *clavicle*.—A false articulation in the clavicle is not to be treated by an exsection of the bones. A patient, whom I have met with, and who had this infirmity from infancy on both sides, experienced no inconvenience from it, and could perform without difficulty the most severe labors. M. Lanctuit (*Thèse de Strasb.*, Avril, 1823) says that M. Bouchet saw a patient in whom half the clavicle was wanting, but whose corresponding arm, nevertheless, was not wanting in vigor and activity. If, however, contrary to all probabilities, a fracture of this kind should be transformed into an annoying malady, and exsection should be decided upon, the surgeon would make a horizontal incision on the antero-superior surface of the bone; as the subclavian vein is found directly underneath, it would be advantageous to draw the ends of the fracture forwards, by means of an elevator or blunt hook, and to hold them in this raised position until the saw should have exsected them.

IV. *The leg*.—It is in the leg that exsection for pseudarthrosis is attended with the greatest degree of embarrassment. The tibia should always be laid bare on its antero-internal side. We cautiously detach the muscles behind and on the outer side, grazing as close as possible to the posterior surface of the bone, in order to avoid with greater security the corresponding posterior tibial artery. In the upper half of the tibia, it would be difficult to perform exsection without joining a transverse incision to the longitudinal one. But perhaps a single incision,

however, would then answer, if we gave an oblique direction to it from above downwards and from before backwards. The exsection of one of the ends of the bone having been completed, we could proceed to the other also through the same wound.

In order to lay bare the fibula, it would be necessary to penetrate between the peroneus longus and brevis and the extensors of the toes, for which purpose a single incision will always be found sufficient. Its exsection, moreover, which would present fewer difficulties than that of the tibia, will have no occasion of being as extensive. Let a callus be once established in the solution of continuity of this last mentioned bone, and the fibula in its turn will inevitably become consolidated.

V. *Femur*.—As false joints in the femur may exist in every part of its continuity, exsection here will have to be performed after rules which must necessarily vary. This bone, however, from the great trochanter down to the knee, is to be laid bare upon its antero-external side, dividing successively the integuments, the sub-cutaneous fascia, the fascia lata, and the triceps muscle. The surgeon having flexed the thigh inwards and backwards, and caused the lips of the wound to be kept apart by an assistant, would have no difficulty in soon coming down upon the fractured angle of the femur; and has nothing more to do than to isolate the two fragments with his bistoury, to the extent of an inch upon each extremity, and then to insert underneath the splint or the protecting compress, in order to put the saw into movement and terminate the exsection.

[Numerous cases of ununited fracture have of late been treated, both in Europe and this country, by Dieffenbach's method of inserting ivory pegs into the divided ends of the bone. Severe constitutional symptoms have occasionally followed, and in one case of pseudarthrosis in the femur reported by Mr. Mackenzie (*Assoc. Med. Journ.* Feb. 10, 1854) the operation, was near proving fatal. In this city, experiments have been made of merely perforating the ends of the bone, without inserting the pegs, and for this method, an equal amount of success has been claimed. G. C. B.]

#### § VI.—*Containing Means.—Braces and Cuishes.*

When pseudarthroses of the humerus and fore-arm are incurable, or that the patients do not wish to have them operated upon, they may be wonderfully relieved by the use of a brace. M. Champion (*Thèse de Paris*, No. 11, 1815, p. 52) has contrived some of tent cloth (or ticking) and small whalebone, which have been found exceedingly advantageous. Briot (*Hist. des Progrès de la Chir. Milit.*, p. 411, 1817,) in three of his patients, found great benefit from the employment of two kinds of half-gutters, of iron plates, padded on the interior, and fastened by tresses, which the patients arranged or tightened at pleasure. I have already remarked, that in Germany, surgeons used with advantage in such circumstances, the apparatus of the equerry, Bailly, (*Rust's Magazin*, B. XV., Heft 2; *Journ. des Progrès*, t. X., p. 257.)

False articulations of the femur have some inconveniences of a more serious character. If, however, there are some who oblige the patient to support himself, and walk with crutches, as in the cases cited by

Lambert, (Lambert, *Thèse citée*, p. 38,) Lions (*Thèse de Paris*, 1804, No. 139, p. 39,) and Sue, (Sue, *Observations, &c., sur quelques Maladies des Os*, p. 18, 21, 22;) there are others, who by means of a cuish, or with or without a cane, enable their patients to walk with ease, (See Vol. I.) I daily meet, says M. Sentin, (*Letter to M. Champion*, March 9, 1833,) a man with a false articulation in the upper part of the thigh who is enabled to walk by means of a very badly constructed piece of mechanism. A soldier, who had a pseudarthrosis in both bones of the leg, could hold himself erect very well, but he could not walk except by means of a very hard bootikin. The tailor, with a fractured femur, who could carry his foot to his shoulder, both in front and behind, and who could, according to Saltzman, (Reisseissen, *Diss. de Artic. Analogis*, cap. II., § 5, 1718,) who mentions this case, use this leg for the purposes of walking and standing, as well as the other, except that he limped a little, from its being shorter, shows what great power nature has under such circumstances.

I have elsewhere spoken (See Vol. I.) of the case related by Sue, (*Reflex. sur quelques Maladies des Os*, par Sue, an XII., 1803, p. 164,) of a man, who, notwithstanding he had a false articulation of the thigh, could walk in the streets with no other aid than his cane. Meckren (*Obs. Méd. Chir.*, cap. LXXI., 1682) and Boyer (Delpech, *Dict. de Méd.*, t. III., p. 451) have also noticed the facility with which some patients are enabled to walk by means of a cuish. But sometimes the cuishes are more injurious than useful. In the case cited by Sue, the power of walking being rendered impossible, when the two ends of the bone encountered each other, obliged the patient to lay aside the cuish, which caused this approximation.

At the upper extremity of the humerus or femur, false joints do not require an operation. The seton, cauterization, or exsection in this place, would be attended with too much difficulty or danger. Besides which, the pseudarthrosis there is not accompanied with as serious inconveniences as it is in the middle of the bones. I have met with two patients in whom fracture of the surgical neck of the humerus had not consolidated, but who were scarcely conscious of its presence.

### ARTICLE III.—EXSECTION FOR DEFORMED CALLUS.

With the view also of repairing, *i. e.*, to pare or flatten down, shape, adjust, &c.) a deformed callus, many authors have proposed or performed upon it the process of rugination (rasping) or exsection. Paul of Egina, (*Daléchamps, Chir. Franç.*, p. 467, 787, 788, 790, 791, Chap. 107, 108, 109,) who recommends, and also describes different kinds of exsections for compound fractures or deformed callus, was censured on that account by Guy de Chauliac, who, according to a quotation in Boyer (*Malad. Chir.*, t. III., p. 107,) complains that a philosopher was nearly killed by the consequences of such an operation, "because he could not content himself with remaining a cripple," but the question of Hevin, who asks if there ever will be found a patient courageous enough to sustain it, or a surgeon bold enough to undertake it, can now be responded to by a multitude of facts. According to M. Oesterlen (*De la Rupt. du Col*, p. 124,) after having broken the callus, he exsected with the saw to the



extent of three lines from the inner and outer portion of the two pieces of the bone. The exsection of a projecting portion of the femur above the knee, after the consolidation of a vicious callus, was also performed upon the famous Ignatius Loyola, at the age of twenty-eight, (A. D. 1521.) An old surgeon, (*Hildanus, in Oesterlen, lieu cité*, p. 189,) in a case of fracture of the femur from a fire-arm, recommended the rupture and exsection of the callus by means of the cutting pliers. Albucasis, according to Oesterlen, had also advised to take off the callus with a cutting instrument when it should become hard like a stone. Gardeil, (*Traduction des Œuvres d'Hippocrate*, t. I., p. 300,) states, that he divided the bones of the fore-arm on one of his nephews at the point of an old fracture, and that he succeeded perfectly. Though in the case of a femur which had united at a right angle, Wasserfuhr, (*Rust's Magazin für die Gesamte Heilkunde; Journal d'Hufeland*, 1816, Octobre,) only separated it with a saw, M. Riecke, (*Bul. des Science. Méd., Journal Analytique*, December, 1828, p. 466; or *Arch. Gén. de Méd.*, t. XVIII., p. 105,) in a case where the thigh was shortened eight inches, did not hesitate to employ the saw, gouge and mallet. A perfect consolidation was established in the space of eight months. An exsection of four fingers' breadth from the body of the two bones of each fractured leg, whose consolidation had been attended with excruciating pains, was performed with success in 1685 or 1686 (*Journal de Méd.*, in continuation of that of *Laroque*, p. 58, 1686.) A young man had a callus in the femur of the size of the head, with the fragments also riding over each other. M. Winehold, (In the *Journal d'Hufeland*, 1816, cap. V., p. 25; and *Journal Analytique*, No. VIII., p. 240, 1828.—*Arch. Gén. de Méd.*, t. XVII., p. 445,) by means of a trephining needle introduced a seton between the fragments, and effected a cure without the necessity of proceeding to exsection. But the operation of exsection here evidently blends itself with what I have said of rupture of the callus in another chapter.

[Dr. Parry, of Indiana, has reported a successful operation to remedy a deformed callus, (*Amer. Journ. Med. Sciences*, Vol. XXIV., 1839.) We have lately seen some interesting cases of this kind in the practice of Prof. Muller, of Philadelphia. The report of an operation by Dr. J. Rhea. Barton, is contained in the *Phil. Med. Examiner*, Vol. 1st, 1842. G. C. B.]

In speaking of the straightening of limbs curved at an angle in consequence of fractures viciously consolidated, I neglected to speak of an operation of this kind which was performed with success by M. Warren. This operation, which in reality belongs to exsections, was performed by M. Warren on the tibia; while M. Clemot and M. Barton had hitherto applied it only to the femur. The leg was bent at quite an acute angle; M. Warren exsected from this boney angle a wedge-shaped fragment, then straightened the limb, and easily effected its consolidation. It is not solely with a view of rectifying a deformed limb and of giving it more or less length, that we sometimes find it necessary to excise certain portions of a vicious callus. After the cure of fractures, boney points or angles may project under the skin, and become the source of pain and of ulcerations that are difficult to heal. Exsection in such cases is not, in my opinion, sufficiently often performed. Meyranx, a physician of

some distinction, broke his leg. After the consolidation the point of the lower fragment of the tibia projected under the skin in the form of a very acute elongated ridge. An ulceration which would re-open whenever he took a little more exercise than usual, together with almost constant pains, were the consequence of his infirmity. An incision of two inches' length and which would not necessarily have comprised anything more than the integuments, would have allowed of this projecting crest to be removed with a single stroke of the saw or cutting pliers; but the patient, who died two years after, could not bring his mind to submit to it. When we reflect upon the frequency of this deformity after oblique fractures of the leg, and the annoyance it occasions, and upon the simplicity and little danger of the operation, it is difficult to withhold our surprise, from the fact that science possesses so few examples in which its exsection has been performed.

The humerus, especially its lower part, is sometimes the seat of a similar deformity. A woman who entered the hospital of La Charité for a comminuted fracture at three fingers' breadth above the elbow, ultimately got well; but when the wound had cicatrized and the engorgement of the soft parts had subsided, it was found, that in the consolidation which had taken place, one of the fragments projected under the skin, above the outer condyle in the shape of a sharp long crest. As this ridge caused pain and interfered with the movements of the fore-arm, the patient was the first to desire its removal. I divided the integuments and aponeurosis to the extent of two inches, in a direction parallel with the axis of the humerus and upon its outer border. The lips of the wound being then held apart and pressed down, I found it easy to isolate the boney projection and to excise it with the cutting pliers. The borders of the wound approximated together in some degree of themselves, and reunion was effected by first intention.

In its application to a deformed callus, exsection of the bone is still one of those independent operations which cannot be restricted to any prescribed rules. In most of the cases the projection of bone to be removed will answer as our guide; in other cases the surgeon is only to recollect the point where he can most easily reach without danger to the bone which he wishes to excise. It is moreover manifest that inasmuch as they do not destroy the continuity of the bone, these lateral excisions and the removal of simple ridges or abnormal projections of the callus, are far from involving the same dangers or constituting an operation as serious as that of exsection in cases of compound or non-consolidated fractures. When once terminated, for example, they require no other attentions than those of simple wounds. The healing up of the solutions of continuity which we are obliged to make, is generally effected with promptitude, and requires no aid from the apparatus used in fractures.

[CASE OF DEFORMED LEG, FROM UNSUCCESSFULLY TREATED FRACTURE, cured by an operation performed by JOHN RHEA BARTON, M. D., (See *Philadelphia Examiner*, Jan. 8th, 1842, Vol. II., p. 16, with a plate.)

About half-past seven o'clock, P. M., on the 18th of December, 1838, while in charge of the deck of the U. S. Ship Ohio, then at sea, Lieute-

nant — fell from the horse block, about four feet high. The weather being cold and boisterous, he was heavily clothed in a pea jacket, &c. His foot became engaged in a coil of rigging on the deck, while the body was carried forward, and the right tibia was fractured transversely at about its lower third, and the fibula at about two and a half inches above the ankle.

A gale of wind, then commencing, lasted several days.

He was placed in his apartment on the orlop deck, where the circulation of air was very much interrupted, and probably much vitiated by the number of persons breathing it.

The limb was set by the surgeon. He suffered very much from the motion of the ship, and in the night was attacked with severe spasms in the limb; and he distinctly felt the fragments slip upon each other.

On the 5th of January, 1839, the ship arrived at Mahon, and on the following day, the nineteenth after the accident, the patient was moved on shore. During the transportation from the ship he suffered great pain from the moving of the ends of the broken bones on each other.

He remained in bed eight weeks, and when he got up, the limb was still flexible at the point of fracture. Getting out of bed was at first very painful, and usually occupied fifteen minutes.

When he got up he was urged to exercise the limb, and three or four weeks afterwards to bear his weight in a degree upon it.

In consequence of the accident, and its unsuccessful treatment, the upper fragment of the tibia rides the lower one, overlapping it about half an inch, forming an obtuse angle which presents inwards. The limb is shortened a half inch; there is a concavity inwards, on the outside of the leg, as might be the case if the fibula were pressed inwards against the tibia at its lower third; the flexor muscles are thrown out of their normal line of action, and the external condyle of the femur seems to be, in a measure, alone in the essential constitution of the knee joint, the internal ligaments being elongated, and the knee thrown inwards. (*See the Cut.*)

The patient suffers no pain; and the only inconvenience complained of is, that his footing is not certain when at sea, and that he suffers under pain and weakness in the knee on taking unusual exercise on shore.

For the purpose of removing this inconvenience, and correcting the deformity, the patient came to Philadelphia, and after having been carefully examined at different times, and at considerable intervals, by Drs. Thomas Harris, W. E. Horner, J. Randolph, W. S. Ruschenberger, J. Rhea Barton, and Paul B. Goddard, anxiously submitted to an operation.

Lieutenant — is a native of South Carolina; he is thirty-four years of age, about five feet eight inches high, of nervous sanguine tem





perament, light eyes, ruddy complexion, and, with the exception of an attack of fever on the coast of Africa, in 1824, has enjoyed uninterrupted health. He does not use tobacco in any form.

For a month he has regulated his diet with a view to the operation, eating moderately of meat once a day.

Having procured an airy, comfortable apartment, and made the necessary preparations, he submitted to the following operation, performed by Dr. J. Rhea Barton, assisted by Drs. Norris, E. Peace, Paul B. Goddard, W. P. C. Barton, and Ruschenberger.

Oct. 18th, 1841. Weather clear and cool. Ten minutes before commencing the operation, the patient swallowed thirty-five drops of laudanum. He was placed upon the table at twelve o'clock.

Two incisions, three inches in length, were made over and parallel with the internal and external margins of the tibia, three inches apart at their upper extremities, and two and a half at their termination. These two incisions were connected by a transverse cut, made a little below the nearly square projecting end of the upper fragment of the tibia; the three incisions describing the letter H. The flaps thus formed, consisting of the skin and subjacent cellular tissue only were raised up, exposing the fragments of the tibia at their point of union. The adjacent muscles were separated from the bone by the handle of the scalpel; the periosteum, very near the lower termination of the upper fragment, was divided by the scalpel; a small saw, somewhat in the form of a carving knife, about ten inches long in the blade, suddenly tapered into a point of two and a half inches long, and rounded at the extremity, was next employed, and a slice of bone, less than a line in thickness, removed from the extremity of the upper fragment. The saw was carefully worked in the same line of direction and in the same plane, frequently removing it to clear its teeth by a sponge, until the lower fragment was divided nearly through. What remained was forcibly fractured—a short, stout spiculum, adhering to the posterior portion of the lower fragment, and which was afterwards removed.

Upon examination it now was found, as was anticipated, that transverse bridges of bone connected the tibia and fibula together above and below the seat of fracture—having been formed there after the injury for the wise purpose of supporting the weakened limb—and prevented the upper and projecting portion from being brought in a normal line with the lower fragment. These bony bridges were removed by the aid of a chisel and strong nippers; and by the same means the ends of the two fragments of the tibia were adjusted and finally brought into perfect coaptation. The operation occupied nearly an hour. No vessel required ligature; and the loss of blood did not exceed eight ounces.

The edges of the wound were brought together, and retained by adhesive straps. Lint, spread with simple cerate, was placed over them. The limb from the toes to the knee was then covered by successive turns of a roller. The patient was now carefully removed to bed. A soft, square pad, two inches thick, was placed over the external malleolus, and a similar one close to the knee joint; upon these was laid a splint two and a half inches wide, to which the two fragments of the tibia were confined by a few turns of a roller applied at the proper points. A soft pillow, covered with oiled silk, was made to half encircle the

limb, by the aid of splints in a splint cloth, and the whole secured by tapes. [Dec. 21st, the patient was walking around his apartment, aided by a cane. T.]

[ON THE VALUE OF THE SETON, AS A REMEDY IN UNUNITED FRACTURES, *Illustrated by Cases*. BY VALENTINE MOTT, M. D. (From the *Transactions of the New-York Academy of Medicine*, Vol. I. Part. I.)

THE surgery of the present day is pre-eminently utilitarian in its character; and the efforts of its most successful cultivators are marked by a desire to establish, by accurate philosophical deduction from the well ascertained facts which constitute our art, the true and real value of our therapeutic resources and operative procedures, rather than by the introduction of novel operations of equivocal value. But a few years ago, every new number of a medical journal introduced to our notice some innovation in mechanical and operative surgery; surgeons seemed determined to secure immortality by novelty, and our manuals of operative medicine have become clogged and unwieldy by the accumulation of various novel processes which, for the most part, lack in utility what they claim in originality.

Time, which determines the value of men as well as of their inventions, has given us a mass of experience, in the way of well ascertained and authentically recorded facts, which, if closely studied and thoroughly elaborated, will serve as the only firm and certain foundation on which to build the advancement of our science. "We know too well," remarks a recent writer, "how enormous is the quantity of facts which have been accumulated in every department of medicine during the last two thousand years; the most pressing want which our science at present suffers, is the reduction of this vast mass into separate groups, and the establishment of certain defined principles. \* \* \* \* It is probably only by the assistance of the statistical test that we shall finally arrive at fixed conclusions respecting the efficacy of various modes of treating a disease, and the prognosis to be formed respecting the issue of various diseases."—(Bisset Hawkins in *Cyc. Prac. Med.*)

The leaders in the various departments of medical science have already adopted this mode of study, and results have been obtained of which we all enjoy the benefit. In the department of pure medicine, the researches of Louis on Phthisis, of Boulliaud on Pneumonia, and of Andral and Chomel on Typhoid Fever, have placed them at the head of the philosophical investigators of that branch of the healing art. The statistics of Collins, of Lee and Boivin, have added much to the certainty of obstetrical science; and, in our own department of surgery, the celebrated tables of Malgaigne on Hernia, and the enlightened labors of Norris, of Philadelphia, on the Statistics of Amputations,—of the ligature of large arteries, and of the results of the treatment of ununited fractures, have secured for them an enviable celebrity throughout the scientific world.

The sum of each individual's experience in the treatment of disease constitutes the basis of his judgment, and stamps the value of his individual opinion, in a given case. The truth of this proposition will be

admitted on a close examination ; for no individual is capable of accurately appreciating the recorded experience of others, except by measuring and comparing it with his own personal knowledge—which, in the end, gives all its practical value to medical learning. As the personal experience, then, of each individual—the most valuable portion of his knowledge—for the most part must die with its possessor, it follows that our science consists alone of those facts which have been placed upon record, by individuals, to serve as the basis of inductive reasoning, and of statistical analysis. These facts are valuable in proportion to their ascertained authenticity, and the character for accuracy of the observer. It is the duty then of every medical man who is anxious for the legitimate advancement of his science, to do his part, however humble, by placing on record such facts as may have fallen beneath his notice, for we may rest assured, that however trivial they may be, if accurately observed, posterity will acknowledge their value. They will take their appropriate place in those statistical results on which in future time medicine will rest its claims to take rank as one of the exact sciences.

I have made the foregoing remarks by way of apology for laying before the Academy the result of my experience on a subject which has recently undergone statistical investigation, with the view of placing on record, should the Academy deem them worthy of a place in its archives, some cases which have never been heretofore published.

I refer to the use of the Seton, as a remedy for Ununited Fractures, an operation which the world owes to an American surgeon—the illustrious Physick, of Philadelphia ; and which the researches of another American surgeon, Dr. Norris, have statistically proved to be, in the present condition of surgical science, the most certain remedy that we possess for that unfortunate occurrence.

It is worthy of remark that the elaborate and valuable paper of Dr. Norris forms the basis of the article on “Ununited Fracture,” in Nos. XI. and XII. of the *Cyclopædia of Prac. Surgery*, which, completed by T. W. King, Esq., constitutes the latest monograph on this subject, which we have from an English authority. The conclusions arrived at in this article, with regard to the comparative value of our remedial means, drawn from the tabular view of one hundred and fifty cases, compiled by Dr. Norris, are embraced in the following quotation :—

“Of forty-six cases in which the *seton* was employed, thirty-six were cured, three partial cures, five no benefit, two died.

“Of thirty-eight cases in which *resection* was employed, twenty-four were cured, one partial cure, seven no benefit, six died.

“Of thirty-six cases in which *pressure* and rest were employed, twenty-nine were cured, one partial cure, six no benefit.

“Of eight cases in which *caustic* was employed, six were cured, two received no benefit.

“Of eleven cases in which *frictions* were employed, eleven were cured.

“Of eleven cases in which other methods were employed, viz. *iodine*, *injections*, *hot iron* and *amputation*, seven were cured, one received no benefit, two died, and one remains uncertain.”

Under the head of seton are embraced its varieties, viz. the conical



seton of Weinhold, the silver wire of Sommé, the double seton of Oppenheim, and the variation adopted by Seerig. Under the head of resection are included all cases in which the ends of the bones were scraped, rasped, or excised.

The opinion expressed by Nelaton, perhaps the most recent surgical authority amongst the French, in his incomplete work on Surgical Pathology, will give an idea of the appreciation of the various remedies in use by the surgeons of France. After enumerating the resources mentioned above, he states that "in the present condition of science it is impossible to determine which of these remedial means would deserve our preference in a given case," and proceeds to quote the following opinion of W. A. Bérard: "When a fracture is found to remain ununited after the lapse of the usual period, reapply the apparatus, give it all the additional solidity possible, and renew it at long intervals; seek, meanwhile, for any constitutional cause in your patient which could prevent union, and remove it if possible. If these means are insufficient, make use of blisters and other irritating applications to the limb over the seat of the fracture; if these fail, resort to friction of the fragments, and replace the apparatus. If you are still unsuccessful examine carefully if your case present any indications (such as caries, necrosis, &c., at the seat of the fracture) which would render resection preferable to the employment of the seton. Should this indication fail, pass a seton between the fragments, and if necessary saturate it with irritating substances; apply caustic to the fragments, and if there is still no consolidation, resection remains to be tried."—Vol. i. p. 684. Velpeau concludes that the seton "is a very uncertain means, and one for which I should prefer to substitute exsection, where frictions and the starch bandage had not answered, and it is one moreover which is not always unattended with danger. M. Weinhold, in applying it to the neck of the femur, brought on caries and suppuration in the cotyloid cavity and pelvis, which ended in the death of his patient."—*Am. ed.*, vol. ii. pp. 689, 690.) If M. Velpeau was influenced in his opinion as to the danger attending the use of the seton by the case of M. Weinhold, which he quotes, we fear he has been led into error. In the only account of this case to which we have access, it is distinctly stated that Prof. W. "was unwilling to try any operation, as the symptoms clearly indicated chronic inflammation, if not actual suppuration of the hip joint. The patient, however, had heard of his cures, and was determined to take the chance. He died of hectic at the end of six weeks."—(*Ed. Med. and Surg. Jour.*, vol. xxvii. p. 399.) Surely this case should not detract from the merits of the operation; it is the only unsuccessful case reported in the essay of Professor Weinhold, in which four successful cases are related, three of which involved the thigh-bone. Professor Gibson, of Philadelphia, states that he has operated in ten or twelve cases with the seton, and has uniformly found it more or less successful.—(*Surgery*, 1841, vol. i. p. 336.) These cases are not contained in Dr. Norris's table; it is to be regretted that they are not recorded in a more tangible form. Dr. Physick is said, by Prof. G., to have twice tried the seton in the thigh; and to have expressed himself as fearful that it would not succeed in any case of the kind.

An interesting fact is mentioned by Prof. Colles of Dublin, in his lectures, from which it would seem that we have a therapeutic resource in these cases which is not generally recognised by authors. "An army surgeon told me," said he, "that while quartered in the West Indies, he once had five or six cases of ununited fractures together, and they were long enough under his care to have been, in the ordinary course of things, united three times over; these men, with their regiment, embarked for Europe; on their arrival the surgeon inspected all the men, and on examining these men who had fractures so long without union, he found all their fractures united, without the patients or himself being at all conscious of when the union had taken place, as their attention had not been aroused by the occurrence of pain, or peculiar feeling of any kind."

Electricity is said to have been used with good effect in producing consolidation in some cases; I have made use of it on several occasions without benefit.

I shall now proceed to detail some cases in which I have used the seton:

*Case I.* In 1817, after having employed in vain, pressure combined with rest, blisters, and electricity, in an ununited fracture of the tibia, I passed a seton between the ends of the bones. At the end of three months the cure was perfect.

This case is reported in the Med. and Surg. Register of the New York Hospital, Pt. II., v. i. p. 375.

*Case II.* In 1819, after employing the means enumerated in Case I., I made use of the seton in a fracture of the femur, which had failed to unite. It was allowed to remain three months. At the end of a year the bone was found firmly united.

This case is also recorded in the Hospital Register, as well as a third, of the humerus, in which the result of the employment of the seton was not certainly ascertained. I have reason to believe, however, that this case was also cured.

*Case IV.* A. B., of Florida, thirty-five years of age, of a good constitution, and in the enjoyment of excellent health, in 1822, received an injury in which he fractured the tibia and fibula of one his legs; in both the bones the fracture was simple. He was treated with the limb in an extended position, and during the treatment no unusual circumstance occurred. At the end of six weeks, on examining the limb to see if the bones were in a state of consolidation sufficient to allow the splint to be removed, it was found that the fibula was firmly united, but that the tibia was as movable as at an early period of the injury.

He was directed to remain quiet a few weeks longer, to give an opportunity for union to take place. This not being accomplished, he came to New York, after the lapse of seven months from the receipt of the injury, and placed himself under my care. At this time his general health was good; he had attempted to use the leg for some weeks, by means of crutches, and bearing a slight weight upon it gave him but little pain; the bone yielded, however, at the fractured point by the least pressure upon the foot.

A strip of blister plaster an inch and a half in width was applied around the limb, at the seat of the fracture, several different times.

Shocks of electricity were from time to time resorted to. The ends of the bones were repeatedly rubbed together briskly; and he was directed to add to the irritation about the point of fracture by more active use of the limb.

These means were faithfully tried for several weeks, but without the least appearance of further consolidation of the fracture. The seton was now proposed to him, as the means which promised best success; he readily consented, and it was accordingly introduced. An incision was made on each side of the limb, and on repeated trials it was found impossible to make a pointed stilet penetrate the ligamentous attachment of the fragments; an ordinary gimlet was then employed, and, through the hole thus made, an eyed probe was passed, containing a skein of silk. The limb was then placed in carved splints, and kept extended on the heel; sometimes it was shifted on the outside, and flexed.

Very little pain or inconvenience attended or followed the operation. He was allowed to continue his ordinary full diet without interruption.

After the lapse of six weeks the bones began to be firm, and from this time I began to remove the seton, thread by thread, until it was all taken away—by which time the bones were perfectly consolidated. The whole time occupied in the treatment, from the introduction of the seton until the union of the bones, was about two months and a half.

*Case V.* George Westerfield, a boy aged twelve years, was sent on to me from Ohio, in 1826, with an ununited fracture of the right *os brachii* of eight months' standing. His general health was good, and no cause could be assigned for the want of consolidation of the fracture, except the difficulty of keeping the parts in apposition. The seat of the injury was about the middle of the bone, and the fractured ends were conical, and separated from each other at least an inch; no pain was experienced on rubbing them together, and there was free motion in all directions. With the ordinary seton needle I passed a seton through the arm, as nearly as possible between the separated ends of the bones. The arm was afterwards encased in splints, and kept as quiet as possible. After the more active inflammation had passed away, he was allowed to carry it in a sling, properly secured and protected. Weeks, and even months passed away without any evidence of union at the fractured ends. At the end of six months, as there was not the slightest prospect of amendment, I withdrew the seton, and allowed the sinuses to heal. After waiting for some weeks, with no evidence of change, I determined to try a second seton; this was again introduced, and of larger size, and after continuing it for several months without benefit, it was also removed.

I now put him into the hospital for further treatment; and after stating, in consultation with my colleagues, the history of the case and the practice that had been pursued, it was determined, as the only alternative of amputation, to try exsection of the ends of the fragments. This was accordingly done by Dr. J. Kearney Rodgers, who followed me in my tour of attendance. In addition to sawing off the ends of the fractured bones, Dr. K. passed a silver wire through each end of the sawed bone, and after twisting the ends together, brought them out of the wound through a canula. The wire from one end of the bone wore



out in a few days, and it was removed from the other a short time after. No great degree of inflammation followed the operation, and in a few weeks, as the wound healed, the os brachii became firmly consolidated.

This is the first time, as far as our knowledge extends, that the ends of the bones have been connected by the wire suture after the operation of exsection. As will appear in the next case I have successfully adopted the same practice, and it has been also tried in numerous cases by New York surgeons; I am not aware that there is a single case on record in which it has failed.

Since the introduction of this operation into the surgical practice of our city, M. Flaubert, of the Hotel-Dieu of Rouen, in France, has adopted the same method with perfect success, and M. Malgaigne in his *Operative Surgery* has given to him the credit of originality in this operative process. He may be correct with regard to the originality, but we know that we can claim the priority of years, for the surgery of our own country.

*Case VI.* James Norton, a middle-aged man, of good constitution, was admitted to the N. Y. Hospital in April, 1830, with an ununited fracture of the humerus above its middle, of three months' standing. The ends of the fractured bone were widely separated, and could not be approximated. A seton was passed through the limb on the 10th of April, and allowed to remain until the 28th of September without producing the slightest benefit, when it was withdrawn. Resection was then practised, and the fragments retained in contact by the suture of well annealed iron wire. Two or three weeks after the operation the wire came away, the arm became gradually stronger, and on the 15th of December, when he was discharged, the union was complete.

I attribute the want of success which followed the use of the seton in this case, to the separation of the fragments. It is reported by Dr. A. C. Post, in the *New York Med. Jour.*, i. p. 275.

*Case VII.* L. M., aged fifty-five years, of active habits, although rather corpulent and phlegmatic, fractured his right femur at its upper third, in January, 1833. After the lapse of ten days, at which period the inflammation had subsided, his limb was placed in the double inclined plane. No unusual circumstance occurred during the ensuing five weeks; the patient was very tractable and obedient, evincing the most earnest desire to get well. On examining his limb, however, at the commencement of the seventh week, to my surprise, and the great disappointment of my patient, it was found that no union had taken place at the seat of fracture. He was requested to remain quiet for two or three weeks longer, to which he cheerfully consented. At the end of this time I found the bone still ununited. The limb was now removed from the double inclined plane, and four thigh splints substituted, with pillows for a support. In this position it was kept for about ten days; each day the dressings were removed and the ends of the bones briskly rubbed together; friction with camphorated spirits was afterwards applied to the thigh and leg, and the bandages and splints reapplied.

After this, the limb was restored to the inclined plane, and the patient requested to remain in bed, and use generous diet. This course was steadily pursued for six weeks, at the end of which time I found upon examination that no union had taken place.

Believing that no benefit would arise from any further delay, I now proposed the introduction of a seton, to which he readily consented. Some considerable difficulty attended the operation, from the lower fragment of the femur being drawn, as usual, behind the upper. To securely lodge the seton between the fractured ends, I was obliged again to resort to a large spike gimlet in the form of a *bit*, to make a passage for the eyed probe, as it was impossible to pass a stilet between them.

A great deal of inflammation followed the operation, with profuse suppuration, and hectic fever,—which continued for several weeks and exhausted the patient very much—so much indeed that I thought at times that I should be obliged to remove the seton altogether. With tonics, however, and an invigorating treatment, after a time the hectic symptoms declined, and the suppuration abated.

In about seven weeks from the introduction of the seton, I found, on careful examination, that some firmness was perceptible at the seat of fracture. This gradually increased, and when it had sufficiently advanced, I began to remove the seton, thread by thread, until it was all taken away.

From the first introduction of the seton, until the fracture was perfectly consolidated, about three months elapsed. He was now permitted to get about gradually, upon crutches, wearing as a protection four short splints about the thigh well secured with tapes, and a roller bandage; the splints were continued for some time after he commenced walking about, and were then laid aside.

After nearly a year of great suffering, when full of cheerfulness and hope of recovery, this unfortunate gentleman again had a fall, and re-fractured the femur at the newly united parts.

He was placed again in bed, and the limb put in the double inclined plane, and treated upon ordinary principles. At the end of six weeks after this accident, the *bone was found firmly united*, and he passed from the use of crutches to a cane,—as in every day cases—and, after all the difficulty and delay which it was his misfortune to experience, he has no more shortening of the limb than occurs in the most ordinary cases.

Case VIII. G. T., a ship carpenter, aged 44, of a vigorous constitution and athletic frame, in the year 1824 received an oblique simple fracture of the right femur—a little above its middle. After the usual antiphlogistic treatment for ten days, the limb was treated in the extended position with Dessault's apparatus. A fair amount of extension had been applied to the limb for the usual period, and upon examination at the expiration of six weeks, no union having taken place, my advice was requested.

I found the patient in good health, lying in the apparatus, which appeared to have been fairly used; the limb was, however, shorter than I have been in the habit of making, with Boyer's apparatus with the screw attached, and I found that the fractured ends had slipped by each other considerably. Free, and indeed rough motion, was given to the fractured ends of the bone daily, for several days, and the limb kept steady in the same splint, without, however, using the least extension. Decided pain and tenderness having been induced by this treatment, I endeavored, by extension, to bring the limb nearer its proper length, but

without success. It was then left in the same apparatus, four short splints having been placed in the thigh over the many-tailed bandage very tightly applied. He was also directed to use a nutritious and stimulating diet. Six weeks having elapsed without the least appearance of bony union, it was determined forthwith to introduce a seton between the fragments.

Upon making an incision on the anterior part of the thigh, down to the seat of the fracture, it was found impossible to pass a stilet or any pointed instrument between the ends of the bones, so close was their connexion. I therefore, as in other cases, used a small gimlet, and followed it with a *bit* containing an eye, into which the seton was passed, and drawn through.

Much inflammation followed the operation, and a copious suppuration, for three weeks. When the discharge was reduced to the ordinary amount from a seton, and the wound had healed to a mere fistulous opening, he began to think that his sensations warranted him in believing that the bones were growing together. In this he was correct, for after about seven weeks the firmness of the limb had so far advanced, that it was thought best gradually to remove the seton. In eight weeks from the time of its introduction the bone was firmly consolidated.

The limb was shortened about an inch, and the foot considerably everted.

*Case IX.* The following interesting and unique case which recently came under my notice (1844), leaves no doubt in my mind of the existence of the non-union of an *intra-uterine* fracture.

F. G., a female infant, four months old, in excellent health, and in every other respect perfect and well formed, and nursing a very healthy mother, was brought to my house in consequence of a distortion of one of its feet. Upon examination I saw, at once, that there was a considerable mobility of the leg about two inches above the ankle-joint, and that this joint, as well as the foot, was perfectly normal. On a more careful inspection I found the tibia and fibula ununited at this point,—that the end of each bone could be distinctly felt, and that this unnatural joint was the cause of all the distortion of the foot and leg. No pain whatever seemed to attend the free movement of the unnatural joint, and the mother assured me that it had been so from its birth.

My first attempt was to render the false joint as immoveable as possible; for this purpose I applied a roller around the limb, and then encased it in pasteboard, retaining this by a second roller. This apparatus was kept accurately applied during several months, and at one time I had great hope that the bones were being united, as there was a decided degree of firmness about the false joints.

As this plan failed, I tried rubbing the ends of the bones together for a few times, and then with a splint and bandage kept the limb quiet for several weeks.

No benefit following this, I applied a narrow strip of blister plaster around the leg, at two or three different times, keeping the apparatus constantly applied. Acupuncture about the ends of the bones was used, with galvanic electricity, but all to no good purpose. I regret now that I did not try scarifying the ends of the bones with a tenotomy knife, as since suggested by Prof. Miller, of Edinburgh, but it did not occur to me.



I now urged the seton, but it was some months before the mother would consent to its use; when she did consent, I felt less willingness to apply it, than in any case I ever met with. This arose from the difficulty of satisfying myself of the exact course of the arterial trunks, as well as of the position of the ends of the bones, on account of their abnormal condition, and the consequent derangement of the soft parts. It was my intention to use but one seton for the two bones, which I accomplished after much difficulty, and great care, by means of a long needle in a stiff handle with an eye near its point. After deciding upon the spot for passing the seton, it was very speedily done, and to my entire satisfaction. The infant seemed to suffer very little pain from the operation, and the inflammation and suppuration which followed it were slight. After the seton was passed, the foot and leg were secured as before.

In about four weeks the bones were quite firm, and from the general practice which I have adopted, in other cases of ununited fracture, I began to remove some threads of the seton. At this time, from what cause I knew not, violent inflammation suddenly came on in the vicinity of the seton, and involved the whole leg. This shower of trouble in a few days swept away all the uniting material, and left the ends of the bones in their original state of mobility.

The seton of course was removed at once. If it had happened that the seton had been removed before this "tornado" of inflammation supervened, it is my firm belief that this curious case would have terminated favorably.

No argument or persuasion would induce the mother to allow the seton to be re-introduced, or to try any other remedy. This child is now (May 9th, 1851,) about eleven years old, a fine healthy girl, with the tibia and fibula still ununited. At the request of her parents, I sawed off the ends of the tibia about three weeks since, and connected the ends of the bones together by a silver wire and canula. The wound has entirely healed by the first intention, except where the canula passes. The result will be the subject of a future communication to the Academy.

#### CONCLUSION.

\* I fear that I have already presumed upon the patience of the Academy, and shall therefore pursue this subject no further at present. It was my design to present, by way of actual demonstration of the relative utility of the seton,—a critical analysis, in a tabular form, of all the cases on record in which it has been employed; setting forth, in the unsuccessful cases, the apparent causes of the failure, and the circumstances under which it has most frequently succeeded, with the view of determining, as far as the facts on record will permit, the nature of those cases in which its use is indicated, or otherwise. This table is in course of preparation, and I shall take the opportunity of laying it before the Academy in a short time, with the practical inferences which our further investigation of the subject may justify. My present impression is this, that the seton will only succeed in those cases of ununited fracture in which the ends of the bones are in actual contact, or very

nearly so; and the facts would seem also to justify the opinion that, in those cases in which the ends of the bones are not in contact, there is no operation which promises better than the resection of the ends of the fragments, and their union by means of wire.

#### ARTICLE IV.—ORGANIC LESIONS.

Exsection for caries, necrosis, &c., though less frequently performed than for the cases we have just spoken of, is nevertheless very often indicated. Apart from the observations of Tenon, (*Exper. sur l'Exfol. des Os*, 3e Mém., 1758, 1759, 1760,) who had the boldness to remove in this manner the great trochanter; of Moreau, (*Thèse*, Paris, 1803,) who, in 1793, excised a considerable portion of the tibia; of Percy and Laurent (*Dict. des Sc. Méd.*, t. XLVII.) who state that for a caries, or rather without doubt for a necrosis of the leg, they have destroyed this last bone by means of the saw, or trephine, to the extent of eight or ten inches, and removed the *entire fibula*; of Bécларd (*Bull. de la Fac. de Méd.*, t. VI., p. 353) who, following the counsels of Desault, also ventured to extirpate by exsection the upper third of the fibula for a spina ventosa; of Hey, who relates in his work many operations of excision of the bones of the leg and arm; of M. Couty of La Pommeraye, who has published an exsection of almost the entire extent of the humerus; French classical authors scarcely make mention of this kind of operation, which was again performed a few years since with complete success at the Hospital Beaujon, for a very extensive necrosis of the tibia. The surgeon, compelled to conform himself to circumstances, and to vary the operative processes according as the limb has preserved or lost its natural forms, and according to the extent and seat of the disease, lays bare the bone by means of longitudinal incisions, or when it becomes necessary, by cutting out at the expense of the soft parts, one or more flaps of sufficient size, and of variable shape. The disease being exposed to view he now makes use of the saw or the trephine; in other cases of the gouge and mallet; the saw, when the bone is cylindrical or not very large; the trephine when it is a large bone and difficult to isolate, or when it presents a great degree of thickness, or, in fine, when the surrounding parts do not admit of the use of the saw; the chisel, when he wishes to remove only a few laminae, or a part only of the calibre of the diseased bone. We may employ also the cutting pliers or any other instrument which the skilful operator will know how to devise. M. Seutin (*Soc. des Sciences Méd. et Nat. de Bruxelles*, December, 1829) who has extracted with singular success almost the entire fibula, had recourse to the trephine to separate its upper extremity and divided the other with a curved saw. It is in such cases that the flexible or chain saws are especially serviceable.

Not only may exsection be performed upon the middle of the limbs for the organic diseases described farther back; but also upon the trunk, cranium, sternum, ribs, clavicle, vertebrae, &c.

#### § I.—The Cranium.

The excision of the bones of the cranium, for caries, necrosis, or de-

generation, has often been performed; and it is this which has served as the point of departure for the operation known under the name of *trephining*.

The instruments we employ in such cases, are the rasp, the chisel, the gouge, M. Hein's saw, M. Martin's osteotome, and the different sorts of rowel saws and the trephine.

For superficial carious affections, whatever may be their extent, we confine ourselves to the use of the rasp. Having laid the diseased parts bare by means of the proper incisions, the surgeon, holding the cutting plate of the rasp in his left hand, and embracing its handle with his right hand, proceeds to scrape and grate the carious or necrosed surface, until he has completely removed it, and perceives red points and a granular aspect, and no longer a yellow or livid tint, at the bottom of the rasped surface. With M. Champion, I cannot understand how Duverney and Richter should have recommended to rasp the bones with a piece of glass, rather than with the rasp properly so called.

If the bone should be degenerated to more than a line in depth; or if, as almost always happens, the case is one of necrosis rather than of caries, it would be difficult to come down to the seat of the mischief by means of the rasp alone; in such cases we might have recourse to the chisel or gouge. But the strokes required upon these produce a fearful concussion, on which account surgeons usually prefer the use of the trephine instead of the instruments in question.

A resource which is sometimes preferred to all the above, when the disease has not penetrated through the thickness of the cranium, is the *red hot iron*. This practice, however, is now proscribed from surgical practice in all cases wherever the cranium does not present an extreme degree of thickness. Thus no one would venture to apply the actual cautery to the frontal, parietal, or even the occipital bones. The mastoid processes alone rigidly admit of its application. The caloric which would soon be communicated thereby to the membranes or the brain, would give rise to accidents more serious than the disease itself.

M. Hein's osteotome, and M. Martin's saw, have, at the present day, put it in our power to remove a part or the whole of each one of the bones, which enter into the composition of the cranium, without the necessity of recurring to the chisel, gouge, mallet, trephine or hot iron. The first of these instruments, in fact, is arranged in such manner, that the diseased bone, after the soft parts have been detached from it, can be removed layer by layer, to any depth and to whatever extent may be desirable. That of M. Martin, for which we may, in a case of necessity, substitute Thompson's or Charriere's saw, enables to circumscribe the whole of the diseased bone, in a circular, quadrangular, triangular or rhomboidal disc, and to remove it by penetrating, or not, down to the dura mater, according as the state of the parts may require, or may allow us to dispense with doing so. With these two instruments, we may and can in fact take out the part of the bone diseased, in the same manner as we would a portion of diseased integument, in making use of the bistoury.

It must be remarked, however, that the instrument of M. Heine, so efficacious in the hands of its author, and of Jæger at Wurtzburg, required an hour and a half's manipulation to remove a necrosis from the



forehead, in a patient of M. Ricord, (*Gaz. Méd. de Paris*, 1834, p. 644-648.)

It is unnecessary, after the operation, to round off the borders of the osseous division with the lenticular knife or rasp. We should restrict ourselves to the removal of the points, angles, or thin scales of bone, if any should exist, which would seem calculated to irritate the soft parts. While approximating the flaps of the hairy scalp, I would not recommend that their edges should, in every point, be brought into exact coaptation, and I regard it as a precept of the highest importance, that we should dress such wounds from the bottom, with small balls of lint, for some weeks, and not endeavor to effect immediate union.

Very extensive portions of the cranium may be removed in this manner, without seriously compromising the life of the patient. Verduc, David, Soulié, and Lapeyronie, mention the cases of individuals who had lost a fourth, or third part, or the *half* of the vault of the cranium, by necrosis or the operation of the trephine, and who, notwithstanding, enjoyed good health. We must learn in the memoir of Quesnay, what we may hope for from an operation of this kind, which Roger, Guy de Chauliac, and De Vigo, among the ancients, had it would seem already formally advised, as Celsus had in fact before them, and which Perey since has taken special pains to bring into repute.

Nevertheless, I would not recommend that the excision of the bones of the cranium should be performed without being specially indicated. Marchettis, Theden, Wurms, and Brahery, (Champion, *Traité de la Resection*, p. 28,) who profess to have employed it with success in epilepsy, have had very few imitators, notwithstanding the remarks of Odier, of Geneva, (*Manuel de Méd. Prat.*, p. 180,) and some other modern authors.

An important circumstance, and one which ought to restrain the ardor of surgeons in such cases, is, that nature herself, alone, often triumphs over caries and necrosis of the bones of the cranium. Because the bones of the cranium are denuded, and in contact with pus, or have been for a long time exposed to the action of the external air, we are not, therefore, necessarily to conclude, that we must undertake their excision. [This is a truth, as I have remarked in a note, in Vol. I., that every practitioner of experience has had occasion to verify. T.] I have elsewhere (*Traité des Plaies de Tête*, Paris, 1834) related numerous facts in confirmation of this assertion, and I could at present add to them a multitude of others. It has so often happened to me to see wounds of the head, of all sorts and of all dimensions, from cutting or blunt instruments, simple or compound fractures, ordinary causes or fire-arms, lay bare the entire surface of the bones, pass into suppuration and remain with their lips separated during the whole period of the cure, and to allow of our recognizing with the probe as well as by means of the eye or finger, the sonorousness and perfect denudation of the bone; and afterwards to observe the surface of this bone gradually recover its vital forces, and become adherent to the soft parts in the same manner as if it was a common wound, and without being attended with the least exfoliation; that I cannot too earnestly recommend to surgeons to rely greatly, in such cases, upon the efforts of nature. I shall again recur to this subject in speaking of the trephine.

§ II.—*Bones of the Face.*

There is scarcely any other part of the face than the bones of the two jaws whose exsection has been treated of under the head of special operations. The other bones of the face, however, also present occasions for the operation of excision or exsection, when affected with caries, necrosis or degeneration, for which reason I shall commence with them.

A. *The Orbit.*—If some point alone on the contour of the orbit should be degenerated, we could remove it without interfering with the eye, and often in fact without implicating the corresponding eye-lid. The os unguis, the ascending process of the superior maxillary bone and the ethmoid, have often been removed in cases of fistula lachrymalis. I shall speak of this further on under the head of this last mentioned disease.

The *supra-orbital arch* was completely necrosed in a woman, who would have willingly submitted to its removal, had not her advanced age and the visceral derangements under which she was laboring at the same time, deterred me from undertaking it. M. Stark (Coulon, *De la Carie des Os*, Wurtzburg, 1833, p. 23) or M. Heine however (*Gaz. Méd. de Paris*, 1834, p. 644) appear to have once performed this operation successfully. There are two different modes in which this operation may be performed; that is, either by raising up on the forehead a semi-lunar flap from the eye-lid which is to be allowed to fall in place after the operation by its own weight, or by bringing down upon the eyelid a flap of the same form from the forehead, which is afterwards to be raised up to its place. The bone being thus laid bare, should then be removed with cutting pliers or the mushroom-shaped saw of M. Martin, rather than with the osteotome of M. Heine. The gouge and the mallet might also be employed, if there should remain any angular projections to be removed. The concussion upon the cranium in this region would be too slight to make it necessary to proscribe the use of these last mentioned instruments in such cases.

The *inferior border* of the orbit being less prominent than the superior, would therefore be less easily submitted to the operation of exsection. It is, however, rare that this part is attacked with caries or necrosis, unless a portion of the maxillary or of the malar bone also participates in the degeneration. Many surgeons, among whom we may mention Jæger, MM. Dietz, (Coulon, *Opér. cit.*, p. 28,) Syme of Edinburgh, and Dieffenbaeh, appear to have performed this operation with success. A large sized callus of the malar bone was successfully removed by Séverin, (*Méd. Eff.*, p. 315, § 953;) Bordenave also, after having extracted several sequestra from the two portions of a carious malar bone, succeeded in effecting a cure of his patient, (*Acad. de Chir.*, t. XII., p. 53.)

B. Without speaking of the cases where the *malar bone* has been removed conjointly with the superior maxillary and inferior border of the orbit, I will remark that the zygomatic wall of the maxillary sinus, and the entire zygomatic arch itself have been exsected by myself in two different cases. One of the patients had had the malar bone carious and necrosed for more than two years. Having laid bare the parts by

means of a crucial incision, I removed the greater portion of the diseased bone with the mushroom-shaped saw and the rest with a few clippings of the chisel. The whole of the malar bone and almost the entire lower border of the orbit were thus extirpated. In the other I applied the point of a very strong pair of scissors at the fistulous opening which existed on the outside of the dental arcade, and divided the whole wall of the sinus forwards, then backwards, and finally upwards, without involving the parts of the cheek properly so called.

C. The *zygomatic arch* which was formerly removed by Loyseau, (*Observat. de Méd. et de Chir.*, 1617, p. 34,) has also been excised by M. Heine or M. Jobert, (*Gaz. Méd.*, 1834, p. 644;) and I have met with two patients in whom it had been for so long a time in a state of necrosis, that it would have been proper to have submitted it to the same operation. We may readily understand in these cases, that the arch being laid bare by means of a transverse incision, which could be transformed into an L if the disease had extended to a great distance in front, and could afterwards be dissected above and below, and the bone removed or detached by means either of Liston's pliers, the chain saw, that of M. Martin, or even the gouge or mallet, &c.

D. Nobody appears to have more boldly or frequently performed exsections upon the bones of the face than M. Dieffenbach. In a note published by him in 1838. (*Expérience*, t. II., p. 55) he relates *eighteen* examples of these operations, which however in the first, second, third, fourth, eighth, ninth, thirteenth and eighteenth cases, relate only to the removal of the alveolar border. In the sixteenth we perceive that this surgeon, in order to remove a cancerous tumor with the greater part of the bones of the nose and orbit, was obliged to dissect up in the manner of a mask all the soft parts of the face. In the twelfth he had to remove also a great portion of the malar bone. His ninth case had to lose thus almost the entire vault of his palate. But these are kinds of exsection for which every surgeon who undertakes them must devise and arrange his own operation.

E. All the exsections of the bones of the face have this peculiarity which distinguishes them from exsections of the cranium; namely, that if the nature or extent of the disease seems to require it, we may associate with them cauterization with the red hot iron, and perform them either by means of the chisel, gouge, trephine or different kinds of saws.

[Surgeons have expressed their views as to the comparative merits of the pliers, chisel, gouge and mallet, in no measured terms, as may be seen by the following extracts:

"The instruments employed by some surgeons, particularly the French, were barbarous to a degree sufficient to shake the nervous system to its centre, and thereby in a weakly person, to diminish those powers of life so necessary to recovery, after the shock of so severe an operation as this is, even when performed by the most skilful hands. I allude to the chisel, gouge, and mallet with which they used to punch out the bone, "every stroke of the mallet causing the most exquisite pain to the patient." (O'Shaughnessy, *On Diseases of the Jaws*, p. 44.) Mr. Liston remarks: "How such instruments could at this period be selected for the purpose, I cannot comprehend. If one were desirous of protracting an operation, and adding to the patient's sufferings, of



jarring the bones of the face and head, and jumbling their contents, no more effectual means could by any possibility be contrived." Mr. Butcher says that the chisel and mallet can seldom be required; "they cause great jarring, and if possible should not be used." (*Dub. Quart. Journ. Med. Science*, Aug. 1853, p. 36.) Contrast with the above views of the subject, the following of Prof. Gross. "Mr. Liston has declaimed quite eloquently against the chisel, and in favor of the pliers in this operation; probably, because the latter instrument was his own invention, and one of his well known hobbies! I have used it on two occasions, upon the upper jaw, but it failed so utterly of its purpose, and produced such a terrible noise and crash, that I never think of it, without horror. The chisel may have its faults; it may jar and shake the head; but I should be loth to believe that it could possibly jar and bruise the parts as much as a pair of the best pliers, however carefully and gently managed." (*On Excision of the Maxillary Bone. West. Journ. Med. & Surgery*, Sept. 1852, p. 204.) The chisel was preferred also, by Gensoul, Lisfranc, and Robert. The pliers, unless well tempered, are very liable to break, as we have seen in more than one instance. G. C. B.]

If the solutions of continuity are not too much complicated with contusions or lacerations, we may then also make trial of immediate reunion. In some cases in fact we shut up the wounds immediately by the aid of anaplastic means. We should be wrong, however, to rely too much on these last mentioned resources. To however little extent suppuration may seem necessary or inevitable, it is much better to dress the wounds flat, or at least to preserve an opening for them at their depending parts, rather than bring them together into too close coaptation.

#### ARTICLE V.—LOWER JAW.

Wounds from fire-arms, accompanied with comminuted fractures, have long since proved that considerable portions of the lower jaw may be destroyed without causing death.

##### § I.—Indications.

Caries or necrosis of this bone also have frequently necessitated its destruction, and yet the persons who have been thus affected have usually been re-established in health, without even having any great degree of deformity result from the loss. Hippocrates had already furnished an example of this kind. Rhazès (*Lib. XXVIII.*, p. 329; *id.*, 1509) relates another case with all the details that could be desired; and Mesue (*De Ægreditinibus Oris*, in fol., c. 3, *De Vulnerib. et Ulcerib. Gengiv.*) also gives the case of a partial exsection of a carious inferior maxillary. F. Plater (*Bonet Corps de Méd.* t. III., p. 148) mentions the case of a young girl who had a part of her jaw carried away by a projectile, and could yet eat (*mâcher*) with the remainder; Boyer (*Bibl. de Planque*, t. IV., p. 656, in 4to) relates the case of a patient who recovered after having the jaw destroyed by the wheel of a mill; Runge (*Coll. de Haller*, trad., t. I., p. 146, Obs. 7) says his father cut out a part of the lower jaw for a sarcoma, whose roots

were implanted in the bone; Faudacq (*Tr. des Pl. par Armes-à-feu*, p. 226, 1746) speaks of a jaw carried away by a ball, and which was partially reproduced, and Manne (*Mal. des. Os*, p. 159) says the same of the chin. A woman had a tumor in the right cheek; J. Burlin, (*Coll. Acad.*, t. VII., p. 500,) being consulted, found a caries at the base of the jaw near the ear, and removed it by a proper operation; a callus which became changed into cartilage, admitted of the functions of the jaw being restored to the same condition they were in before. Gooch (*Gazette Salut.*, No. 28, p. 2, Col. 2., 1775) excised to the extent of an inch from a carious lower jaw, and Mosque (*Journ. Méd.*, t. LXXI., p. 507, No. 10) effected a cure of a cavernous exostosis of the lower jaw. If the individual who lost half his jaw by necrosis, found it impossible to perform mastication, the other patient whom Schmucker (Rougemont, *Chirurgie du Nord*, t. I., p. 192) speaks of, and who had his jaw carried away entire by a cannon ball, was completely restored. One of the most remarkable cases is that mentioned by Guernery (*Mém. de l'Acad. de Chir.*, t. V., p. 164, 1819) at Bicêtre; the lower jaw exfoliated entire, and was reproduced to such extent as to perform mastication! V. Wy (*Journ. de Desault*, t. II., p. 48) speaks of a patient who lost almost the entire lower jaw either from spontaneous causes or by art. Two similar cases are related in the Journal of Desault, (*Ibid.*, ou t. I., p. 107, et t. II., p. 179.) Chopart and Louis have also made exsections upon the lower jaw, [*en fait l'extraction*, not meaning, of course, the *totality* of the jaw. T.] with success, (Chopart, *De Necrosi Ossium*, 1776.) In a negro, says Walker, (*Acad. Royale de Chir.*, t. V., p. 246,) in whom it became necessary to remove the two branches, and a part of the body of the jaw, mastication was ultimately re-established. A woman who Rayger (*Ibid.*) saw at Bourges, had lost the right half of her jaw. Weper speaks of a patient upon whom amputation of one side of the jaw had been successfully performed in his time. The patient that Belman (*Acad. de Chir.*, t. V., p. 245) speaks of, had lost *two-thirds* of the jaw. Finally, M. Larrey (*Clin. Chir.*, t. II.) mentions the case of a soldier, who had had the jaw almost entirely destroyed by a discharge of fire-arms, and who is still living. Even at the present day we may still see at the Invalides many individuals who still carry the traces of similar mutilations.

Nevertheless, facts of this kind had remained without application, until Dupuytren, (*Leçons Orales*, t. IV.,) in 1812, came to the determination to amputate *almost the entire body of a cancerous lower jaw*, by a method entirely *new*, and which has been received into practice under the title of a surgical conquest. Since then, this operation has been repeated a great number of times by the same surgeon, afterwards in Germany, England, America and France, by MM. Mott, Richerand, Lallemand, Delpech, Roux, Cusack, Martin, Gerdy, Magendie, Colquet, Wardrop, Lisfranc, Warren, Gensoul, Graefe, Walther, Wagner, Randolph, and myself. [See the Table below. See also Dr. Mott's CASES OF EXSECTIONS OF THE JAWS, in the General Remarks on *Exsections*. T.]

It is not for necrosis only that the operation is performed, but also and especially for cancers, and all those organic affections which, in the jaw as everywhere else, can only be cured by the extirpation of the parts which are the seat of them. Though it might have seemed difficult to

have relied upon any prospect of success if the exsection was extended beyond the first molar teeth, seeing that in that case the attachments of the genio-glossus, genio-hyoideus, mylo-hyoideus and digastric muscles being destroyed, the tongue acted upon by the glosso-pharyngeal muscles would necessarily be drawn backwards, and close up the pharynx so as to cause suffocation, yet has experience only partially confirmed these apprehensions, Dupuytren went beyond the first molar teeth; in M. Richerand's case, the whole body of the bone was removed. I have in two cases exsected this bone up to the canine teeth. After the dressing, no precaution was taken to fix the tongue in front, yet no unpleasant consequences resulted from it in this respect. *M. Capelleti (Annales Univ. de Méd. d'Omèdi. vol. lxxxvi, p. 39)* who has published a long memoir on this subject, relates that the exsection of two-thirds of the lower jaw was completely successful in the case of a woman who was pregnant. Not less successful were the cases of the two patients operated upon by M. Syme. (*Ed. Med. and Surg. Journ. vol. exxxvii, p. 382.*) I also twice removed, at the Hôpital de la Charité, in 1839, the right half of the lower jaw in two women who both recovered. Operated upon after my method by M. Sanson, for a cancer which occupied the left side of the lower jaw, the patient of whom M. Tigné (*Bull. de la Soc. Anat. 1838-39, p. 302*) speaks, appears to have done exceedingly well.

M. Walther [it is said, in fact, the *totality*, (*Arch. Gén. de Méd. t. II., p. 466*)] but I do not know what proof there is of it] and M. Graefe according to M. Pattison, and afterwards M. McClellan, have removed almost the entire jaw, and yet their patients recovered.

[Dr. Geo. McLellan removed the entire lower jaw in a state of necrosis. "In a few weeks, the periosteum secreted a new and slender plate of bone, which kept the chin prominent, and maintained a tolerable shape of the original entire circle of bone, from joint to joint, on each side. The angles were very obtuse, indeed, almost deficient, but the little girl grew up to become a fine-looking woman with a very narrow lower jaw, and deficient teeth below. Some of my friends thought I must have left a thin plate of sound bone behind at the time of the operation; but they were mistaken. (*McLellan's surgery, p. 357.*) Dr. M. insists on the importance in such cases of leaving as much of the periosteum as possible, in order that we may have a regeneration of osseous instead of ligamentous matter. Mr. Stanley has reported a similar case which came under his care at St Bartholomew's Hospital. Dr. Ganwesky of Westphalia, in September 1838, removed the entire lower jaw for necrosis, and a new jaw was partially formed afterwards, which though not very useful in mastication, nevertheless served to prevent any disfigurement. (*Hartmann's Med. Journal, Leipsic, Vol. XXXIX. No V.*)

The entire lower jaw has also been removed, for necrosis, by Heyfelder, Mr. Perry, Dr. Carnochan, M. Maisonneuve, of Paris, and Pitha, of Prague. Mr. Cusack, of Dublin, informed the writer, June 2d 1853, that some fifteen years before, he had, for osteo-sarcoma extirpated the entire bone, and that the patient died a week afterwards, during his absence from town, in a supposed epileptic fit. In Prof. Syme's "*Contributions to the Pathology and Practice of Surgery*, page 21, is the report of a case in which this surgeon removed the entire lower jaw



for osteo-sarcoma. The patient died suddenly the next day, as was supposed from suffocation produced by the retraction of the tongue.

In 1850, Prof. Ackley, of Cleveland, removed the entire lower jaw, for osteo-sarcoma, and the patient survived the operation some two years. We have seen the removed bone, now in his possession.

Dr. Signoroni, of Padua, on the 27th Sept. 1842, exhibited to the Medical Congress of Padua, a patient in perfect health, from whom, by successive operations, he had, for osteo-sarcoma extirpated the entire lower jaw (*Annali Univers. de Medicine*, 1843, also, *Phil. Med. Examiner*, Vol. VII. 1844, p. 96.)

For many years, Walther, of Bonn, has had the credit of having successfully removed the entire lower jaw, and as his claims have recently been disputed, we are happy to be able to place before the reader the following extract from a letter of Dr. J. E. Webber to Dr. Perkins of this city. Dr. W. is a nephew of Walther, and is well known personally to many surgeons of this city. He thus writes: Suffice it to say that I myself am acquainted with eye witnesses, yet living, who saw the case before the operation—during the operation—and after the operation and subsequent recovery, and there is at this moment in the hands of the eldest son of Walther, a distinguished physician at the capital of Bavaria, a written account, minute in its details, affording a complete history of the case; which report, written by himself, at the request of his father a few days subsequent to the removal of the bone, will be published among the collected papers of Dr. Walther which his family are about giving to the world."

Dr. Mott informs us that there is now in this city an individual, whom he has examined, and who says that his entire lower jaw was removed by Mr. Hutton, of Dublin. G. C. B.]

If the disease is situated on the right rather than on the left, or on the left rather than the right, it is practicable to leave intact the opposite half of this bone, and to remove only the side which is affected, as has been done by MM. Mott, Colquet, Jæger, Blanchet, Roux, &c.; in such cases, we can have no apprehensions about the inconvenience which has been mentioned. And it is still less to be feared where we can remove the whole of the disease, and still preserve one of the borders of the jaw.

It is certain, however, in other cases on the contrary, that the tongue is drawn with great force backwards and upwards as soon as its anterior attachments are divided. Dupuytren always warned his pupils of this; and Delpech, who has made it the subject of some interesting remarks, imagined that it might be prevented by passing a thread of gold or one of the sutures of the wound through the tongue near its frænum, at the moment of dressing, and fixing it to the teeth which were situated nearest to the extremity of the fragment of bone preserved. Perhaps there might occur here another thing beside retraction. The os hyoides and the base of the tongue suspended to the chin, furnish to the larynx and œsophagus every facility of dilatation for the passage of the air and aliments. But having no longer now any attachments in front they yield completely to the action of the other muscles, as well as to the *pressure of atmospheric air*, and leave the pharynx to *collapse* from before backwards, and the posterior fauces to close up from below upwards without

there being any means of re-establishing the equilibrium. This explains why M. Lallemand was obliged to perform tracheotomy in one of his patients, and how those of MM. Ehrmann, Schuster and Bégín were attacked with asphyxia.

[This retraction of the tongue doubtless destroyed the patients of Messrs. Cusack and Syme, after the removal of the entire bone, and Dieffenbach states in his *Operative Surgery* that he has witnessed this accident several times, and that one of his patients, the first evening after the operation, was nearly suffocated before discovered. In a case where we removed the symphysis, together with a great portion of each side of the jaw, our patient was nearly suffocated from this cause, and for some time afterwards this tendency to retraction of the tongue had to be narrowly watched. In another case, we took the precaution to secure the tongue before commencing the operation, yet the moment its attachments to the bone were severed, so great was the retraction that this patient also was nearly suffocated. We have twice disarticulated the lower jaw and several times removed the symphysis and body of the bone, but have never lost a patient from the operation. G. C. B.]

## § II.—*The Operative Process.*

Four modes of performing the exsection of the lower jaw are now received into practice: 1. exsection of the middle portion; 2, exsection of one side; 3, exsection of the lower border; and 4, exsection of the superior border.

A. *The Body of the Jaw.*—When the disease involves the chin only, the operation is generally easy and very simple. There are two modes of performing it. If all the soft parts are sound we restrict ourselves to their division on the median line from above downwards from the free border of the lip to the thyroid cartilage, and then to dissecting off, while reversing them outwards, the two flaps thus formed by this first incision. In the contrary case two incisions united upon the larynx in front should be made to circumscribe a V or a triangle which would include the whole of the disease.

I. The *dressings*, as in hare lip, are composed of needles, threads, a chafing dish filled with coals, and cauteries and all other objects necessary to the more delicate kind of amputations and dissections. Three assistants at least are also required.

II. *First Stage.*—The patient is placed upon a chair or upon a bed slightly elevated. If the objection to the sitting posture be that it exposes the patient to syncope, the horizontal might lead to suffocation from the blood. The assistant placed behind, with one hand, turns the head slightly backward, and with the other seizes the angle or right side of the lower lip at the moment the surgeon is about to commence the incision. The latter grasps with the two first fingers of the left hand the free border of the same lip in the opposite direction; then makes, with a convex or straight bistoury in his right hand, the proper incisions; seizes successively the two sides of the wound and detaches them to a sufficient extent from the seat of the disease, taking care to commence on the right side. This being done, he detaches the muscles and all other soft parts which adhere to the borders and inner surface

of the bone, endeavoring meanwhile to avoid the insertion of the genio-glossus muscle. M. Ulrich is in an error in advising that we should here detach the parts down to the periosteum, for if that were even possible, we should in this manner favor necrosis in the fragments of bone to be preserved. Having isolated the bone on each side without touching the muscular attachments at its middle portion, Delpech glided a gorget underneath to protect the tongue during the action of the saw.

III. *Second Stage*.—We might, also, as some practitioners advise, and as I myself prefer, reserve the last mentioned stage of the operation for the conclusion, and saw through the jaw before thus dissecting off the tissues. A handle-saw, or one of the ordinary kind even, if necessary, or the articulated saw if we prefer, will execute this part of our purpose. A tooth on each side of the confines of the disease should be extracted, if they have not already fallen out, or threaten to be in the way of the action of the saw. The operator, holding in one hand the anterior portion of the diseased mass, applies his thumb a little behind it and upon a sound portion of the bone, held firmly also near its angle by an assistant, in order that he may direct the action of the saw, which should, as nearly as possible, strike between two of the alveoli, and be moved from above downwards, or from below upwards, according as may be most convenient. This first division being completed, an assistant seizes with his hand the diseased tissues. That of the surgeon is now placed behind. A second movement of the saw finishes the section of the bone, which is to be depressed, in order to make it project out in front, while other assistants separate, draw back and carefully protect the soft parts of the face and neck.

IV. *Third Stage*.—There now remains nothing more to be done but to detach the diseased fragment from the tissues which occupy the interior of the mouth, by directing the bistoury flat-wise and perpendicularly upon the posterior surface of the chin. At the same moment an assistant, having a piece of linen around his hand, seizes the tongue by its point, and drawing it outwards, thus prevents the symptoms of suffocation, and enables the surgeon to apply a cautery heated to white heat over the whole extent of the bottom of the wound, or every where at least where any arterial branch can be found.

V. *Fourth Stage*.—By means of two or three points of the twisted suture we unite the two lips of the solution of continuity, the inferior angle of which should be left open or have inserted into it a *mèche*, (See Vol. I.) in order to give free exit to the suppuration which ensues. Adhesive plasters, plumasseaux, compresses and a sling bandage (See Vol. I.) complete the dressing; sometimes we add also some small balls of coarse lint, placed behind the tissues of the face in order to fill up the void left between the fragments of bone. M. Gensoul, apprehending that the cicatrix by being placed on the median line might, after the cure, by its retractility, flatten the chin too much, proposes to place it upon one side; but this precaution would be of no use and would not prevent the accident which suggested it.

If the tissues in front of the bone were all sound, we would be enabled, by raising up a large semilunar flap from the supra-hyoidean region, to the mouth, as M. Roux has done, (*Jour. Hebdom.*, t. VII., p. 806,) to avoid implicating the continuity of the lip, and without thereby rendering the operation more difficult.



VI. —When the loss of substance is not considerable, it is well to replace the fragments of the bone in contact, and as Delpech has done, keep them immovable by fastening a metallic thread around the anterior teeth. In the contrary case, this precaution would, to say the least, be useless. The species of noose through the inferior surface of the tongue, recommended by the Professor of Montpellier, could only be advantageous, where this organ should continue to be violently retracted towards the throat. Some persons consider the bandage superfluous, and confine themselves to the suture and adhesive plasters, which gives more liberty to the parts, and enables the surgeon to examine better every step of the reparative process. But all this must be contingent, and left to the pleasure of the surgeon.

VII. The *sub-mental* artery, the *sub-lingual*, very rarely the *ranina*, and the branch which terminates the *inferior maxillary*, together with the *coronary artery of the lips*, are the only ones which the instrument encounters, that require some attention. Some of the first mentioned are too difficult to come at in the midst of the tissues, to attempt to apply the ligature to these. Possibly the application of cold water, and sponges wet with vinegar, might enable us to control the hemorrhage they give rise to, and allow us to dispense with the use of the hot iron. Nevertheless, as Dupuytren constantly made use of this resource with success, prudence, at least, if not necessity, justifies its employment. The three last mentioned arteries cease to bleed spontaneously, and scarcely ever require our interposition. In one case M. Graefe met with a hemorrhage from the dental artery in the centre of the bone. In such cases a peg of wood or wax, as was used by M. Magendie, or any compressor whatever upon the point, from which the blood appeared to escape, might be made use of, if we did not wish to have recourse to the actual cautery. Finally, instead of a vertical incision, or two incisions united at their lower extremity, it may become necessary, should the disease have extended to a great distance towards the neighborhood of the angles of the jaw, to divide transversely each lip of the wound below the inferior border of the jaw. In a patient, who had the chin shattered by a discharge of a pistol ball, and in whom it became necessary to exsect the jaw, as far back as the molar teeth, I was obliged to dissect to great extent the two flaps of soft parts on each side, in order to enable me afterwards to unite without any effort the two lips of the wound.

B. *One of the halves of the Jaw.*—When the amputation is to comprise only one of the sides of the jaw, the operation is somewhat different from the one we have just described.

I. M. J. Cloquet began with the vertical incision, which has been described above; then made a second, which extended from the commissure of the lips to above and behind the angle of the jaw; and dissected, as he reversed outwards and downwards, the very large flaps of soft parts thus traced out; then detached the tongue from the inner surface of the alveolar border, and terminated by the section of the bone first in front and then behind at the origin of its ascending portion.

II. *The Author.*—Operating on an old man for a sarcoma, I began with a horizontal incision, extending from the left labial commissure to the summit of the corresponding mastoid process, and which I transformed into a T incision by means of a vertical one carried down to the

great horn of the os hyoides. I had thus two triangular flaps, which I dissected, and turned back, the one in front and the other behind. After having sawed through the bone near the symphysis, I proceeded to detach from it the soft parts behind and underneath. Having raised up the angle of the jaw, and isolated the ramus, I cut through the neck of its condyle with the flat rowel of M. Martin. The fragment could then be separated on the inside, and depressed, and removed with the sarcoma, which, moreover, extended under the tongue, and to near the pharynx.

III. *M. Mott* proceeded in a manner somewhat different. He began with a ligature upon the carotid artery upon the diseased side, and only afterwards proceeded to the amputation of the jaw. His first incision was made to extend from a point in front of the ear, on a line with the condyle, (obliquely downwards and forwards,) so as to form a semilunar line with its convexity backwards, (and then brought still further forward, and finally upwards,) to a point above the chin, under the labial commissure. [We have interpolated this passage a little to make it more full and clear. It will be seen that even in the greater exsections, Dr. Mott now makes but one incision; that for tying the carotid being a small incision, altogether separate and distinct, and forming in fact a preliminary operation in itself. T.] The integuments, the lower part of the masseter muscle, and the parotid gland were then reversed upwards and forwards. A second incision, beginning at the upper extremity of the first, and passing below the ear, and reaching to the anterior border of the sterno-mastoid muscle, enabled to lay bare the whole extent of the diseased mass. By means of a small saw, he was enabled to divide the jaw in front on a line with one of the lateral incisor teeth. With another saw, which was smaller and made expressly for the purpose, M. Mott effected the section of the ramus of the jaw immediately below its two superior processes, and finally did not terminate with the removal of the whole diseased mass, until after having carefully detached from it the internal pterygoid and mylo-hyoid muscles. In this last stage, he advises that we should make a complete division of the inferior maxillary nerve before making any traction on the bone, also that we should not forget that the lingual nerve of the fifth pair is in the neighborhood.

Upon the supposition that it may be necessary to disarticulate the bone, which M. Palmi appears to have been the first to perform, viz., in the year 1820, and which operation has since been performed by MM. Graefe, Mott, Dzondi, Withusen, McClellan, Liston, Langenbeck, Syme, Dupuytren, Cusack, Jæger, Anderson, Gensoul, Warren, Lisfranc, Fricke, Lallemand, and Helling; the process of M. Mott would answer full as well as for the exsection which we have just described. That which I have employed would still better fulfil the indication in such cases. A third incision, brought down from in front of the ear to the mastoid extremity of the first incision, would easily enable us to reach the articulation, without making it necessary to tie the carotid artery previously. It is, however, evident that, in these cases, the nature and extent of the evil must at every moment modify the particular rules of the operative process; so that every surgeon is in some sort the inventor of his own process at the moment of the operation.

IV. *Process of M. Graefe.*—M. Graefe, (*Graefe's C. F. Bericht*

über das Clinische, Chirurgisch und Behre, in Rust's Magazin,) who, like M. Mott, first tied the left earotid, then made an incision from the commissure of the mouth to the posterior border of the lower jaw; a second incision, of a crescent shape and terminating in the two extremities of the first, included a portion of the diseased skin; a third incision, prolonged from the posterior angle of the two first, and approaching the meatus auditorius externus, was extended upwards to beyond the condyle. The maxillary bone, laid bare by dissection, sawed upon the median line, and then detached on the inside from the surrounding tissues, was now disarticulated. The sutures were then inserted, and a speedy cure followed; nothing remained on the cheek but an opening of two fingers' breadth, through which the tongue could be seen, and from which the saliva occasionally oozed. M. Rust, who saw the young girl seven years after, dragging out a miserable existence, said that no one would be tempted, after such an example, to repeat the same operation; in that he was deceived.

V. *Process of M. Cusack, attributed to M. Lisfranc.*—M. Cusack, who performed this operation at Dublin four times in 1825, proceeded thus:—

The *first case*, 13th of May, 1825, was one of osteo-sarcoma. The totality of the jaw was tumefied, and all the teeth on the left side loose, the angle and ramus of the maxillary seemed both affected at the same time. The patient was seated on a chair, with his head turned to the right. A *first* incision was brought down from the labial commissure to the base of the jaw; a *second* extended from the zygomatic arch to the angle of the bone; a *third*, extending upwards and outwards from the inferior extremity of the first, united it to the second. The masseter being raised up, it was ascertained that the disarticulation alone would be sufficient, as the coronoid process, separated from the rest of the bone, had been previously removed. The disarticulation was effected upon the outer side of the bone, there were no vessels divided, and the patient got well.

*Second case*, June 3d, 1825.—The tumor extended from the neighborhood of the articulation to the small molar tooth on the opposite side. It was of very large size, and occupied the whole of the sublingual space. The bone was first sawed through, near the small molar tooth on the left side, with the chain-saw. The incisions were made as in the preceding case; but M. Cusack could not immediately accomplish the disarticulation. He made another section of the bone, and disarticulated the remainder. Five or six arteries were tied, and the operation lasted fifty-five minutes. The patient recovered, and scarcely any deformity was perceptible.

*Third case*, October 7th, 1825.—The degeneration occupied the whole right side of the bone, and formed a mass much more voluminous than in the preceding case. The bone had undergone a solution of continuity, and the general health was greatly impaired. A *first* incision extended from the commissure to the anterior side of an opening which existed on the cheek. A *second* incision, which was vertical, sat out from the termination of the first. A *third*, parallel with the line of the symphysis, circumscribed a flap which, adherent on its lower part, was now dissected off. The tumor was now exposed, with its ragged



and fungous aspect. The surgeon divided the bone at a point where a tooth had been extracted. The opening of the tumor was then circumscribed by two incisions, which united together behind and above. At this point of union there terminated another incision, which had been made in a line parallel with the direction of the glenoid cavity. After the dissection, the maxillary bone transformed into a cancerous mass, intersected by numerous fissures, was removed by piecemeal. The hemorrhage was not abundant, and the cure was promptly completed.

VI. *M. Anderson* first sawed through the bone on a line with the angle of the mouth. Having perceived that the medullary membrane was diseased, he determined to proceed to the disarticulation. He divided the cheek from the commissure to the masseter, detaching this last from the bone. Raising up the tissues, he found great difficulty in separating the coronoid process from the temporal muscle. During the tractions, the bone broke, which enabled him with ease to separate it from the deep-seated tissues, and to remove the fragments by means of the forceps and scalpel. There were only two arteries to tie. The wound was united as in a hare-lip, but the patient died at the expiration of thirteen days. An effusion was found in the chest.

C. *Appreciation.*—Whenever we amputate, instead of the chin, one of the halves of the lower jaw, the facial artery must necessarily be divided. In the operation of *M. J. Cloquet*, it was divided at the moment of making the transverse incision, and then again in turning back the flap; but in the last step of the operation, it could, if necessary, have been avoided. In proceeding like *M. Mott*, we inevitably divide it on its passage upon the external surface of the bone. When the disease does not extend beyond the angle of the jaw, it is evident that the process of the French surgeon claims the preference. But when, on the contrary, the degeneration has extended very high up towards the temporo-maxillary articulation, we are more certain, by imitating the American professor, of laying bare the whole disease, while we at the same time save the parotid gland and its duct. His process would apply equally well to disarticulation, if it should be preferred or become necessary. In operating after the manner of *M. Cusack*, or in following my process, we are placed still more at our ease.

The *previous ligature* upon the carotid, as practised by *MM. Palmi, Mott, Cusack, Walther, Gracfe, Gensoul, and Warren*, can become indispensable only in a very small number of cases: as, for example, where the saw is to act transversely, and very near the temporo-maxillary articulation; even then we can most usually dispense with it. The temporal artery, (which was once divided in England,) the internal maxillary, the external carotid, and the inferior dental, which run along by the side of or turn round the posterior border and neck of the condyle, where they are found upon the inside of the ramus of the maxillary bone, could easily be held aside by an intelligent assistant, at the moment when, after having made the section of the jaw in front, the operator should wish to disarticulate it behind, and detach it from the tissues which adhere to its inner surface.

The ligature applied to them separately afterwards, would be a last resource that would protect us from every danger, and the compression of the primitive carotid is a thing so easy that we have no occasion to

disturb ourselves on that subject. [It is probable that the author means here by *la compression* of the primitive carotid, a *ligature* upon it; if he means to rely upon pressure made on the carotid tubercle of Chassaignac, it could not be effected without difficulty or danger. T.] After having filled up the space which separates the two ends of the bone with lint, agaric, or pieces of sponge, we must unite its borders by means of a sufficient number of needles and twisted sutures, in the same way as after a simple amputation of the chin.

D. *Consequences.* At the first announcement of this operation, it was thought that there would result from it a very great degree of deformity, and an impossibility of performing mastication: nothing of this kind has happened. In *Lissier*, the first patient operated upon by Dupuytren, almost the entire body of the bone was removed. Nevertheless it is at the present day scarcely perceptible. It is the same with almost all the other persons operated upon who have survived, not excepting even that of M. Ehrmann. Cellulous granulations soon develop themselves between the fragments of the bone, and are not long in establishing there a sort of fibrous or cartilaginous mass, which ultimately acquires a degree of solidity almost equal to that of the jaw which it replaces, and between whose two halves it forms a solid union.

It is, however, to be remarked that the patient of M. Lallemand was not so fortunate. In him the two ends of the bone remained movable, so that he is obliged to wear an artificial chin. But the loss of substance had been considerable. The wound may rest fistulous at its inferior angle, as in the patient of M. Graefe, and in this manner by the discharge of saliva exhaust the strength of the patient. One of those I operated upon was in that situation when an erysipelas carried him off on the twenty-second day of the amputation. In a patient operated upon by M. Richerand, I have seen the tongue remain drawn back in the mouth and prevent the admission of the food. Death ensued on the twenty-eighth day, and appeared to be produced by suffocation. Perhaps the same result took place in the woman operated upon by M. Magendie at the Salpêtrière in 1830, and who suddenly perished in the night.

After the ablation of one of the lateral portions of the jaw, the fixed point of the genio-glossi muscles having been preserved, there is less danger to be apprehended of retraction of the tongue. But then a deviation of the prominence of the chin, sometimes quite marked, is almost inevitable. This is what took place in the patient operated upon at the hospital of Perfectionnement in 1826, and what was remarked also in the cases related by MM. Mott, Gensoul, Lisfranc, &c.

E. *Amputation of the jaw*, however, is a fortunate acquisition of modern surgery. The dentist Koecker, who has asked the question if it is ever indispensable, would not have the right to censure it in so formal a manner except he had a good remedy for cancer. Incomplete as it is, the following table shows what we have to hope or fear at present from such an operation:—

Dupuytren, 18 cases—15 cures, 3 deaths.	} <i>Leçons Orales</i> , etc., t. IV. <i>New York Med. and Phys. Jour.</i> Vol. I. and II., p. 401, and Private Communication.
Mott, 9 cases—2 disarticulations, 3 deaths.	

- Richerand, 2 cases—2 deaths. Observed by me in 1821.
- Delpéch, 2 cases. *Mem. des Hôp. du Midi*, t. I., p. 615. *Bull. de Férussac.*, t. XII., p. 320.
- Lallemand, 2 cases—1 disarticulated, cancer cured. *Arch. Gén. de Méd.*, t. I., p. 123. *Lafosse, Clinique, St. Eloy*, p. 18.
- Roux, 5 cases—2 cancer, 1 necrosis. *Lanc. Fr.*, t. II., p. 320, *Journ. Hebd.*, t. VII., p. 306; and Private Communication.
- Cloquet—necrosis, sarcoma, f. g. Published by me, *Arch. Gén.*, 1827.
- Gerdy, 3 cases sarcoma—2 deaths, 1 cured. *Arch. Gén.*, 2e sér., t. IX., p. 58, Sept., 1835.
- Gensoul, 2 cases—1 cured, ligature of carotid: Disarticulation; 1 death. *Lettre Chir.*, p. 57, 1833.
- Martins, 1 cure. *Journ. Hebd. Univ.*, 1835, t. XII., p. 229.
- Goyrand, 1 cure. *Ibid.*
- Magendie, 1 case—1 death. *Journ. de Physiologie.*
- Cusack, 8 cases—4 disarticulations—3 cures, 1 death. *Thèse de Kock, Jæger. Journ. des Progrès*, t. VI., p. 273.
- Wardrop, 1 case. *The Lancet*, April, 1827.
- Warren, 2 disarticulations—1 excision, 1 cure. *Journ. des Progrès*, t. X., p. 256.
- Graefe, 5 disarticulations—the woman cured. *Rust's Magazine*, etc., *Thèse de Kock.*
- Lisfranc, 7 cases—4 deaths, 1 cure, 2 disarticulations. *Pauly, Bulletin Clin.*, t. I., p. 463; t. II., p. 11, 18, 73, 201. *Gaz. Méd.*, Sept., 1838.
- Walther, 1 death. *Jour. de Graefe and Walther.*
- Wagner, 1, half the jaw. *New York Med. and Phys. Jour.*, Vol. V.
- McClellan, 2 cases—1 cure, 1 death. *Pattison, Burns' Anatomy*, p. 499.
- Randolph, 1—necrosis—right half of the jaw. *Jour. des Progr.*, 2e sér., t. III., p. 268. *Medical and Surg. Jour.*, Nov., 1829.
- Beauchêne, 1—cancer—return of the disease. *Piedagnel, Thèse; Jour. Hebd. Univ.*, t. II., p. 43.
- Bégin, 1 case—cancer—death. *Reverdit, Thèse No. 85, Paris*, 1837.
- Gambini, 1—necrosis—cured. *Bull. de Fér.*, t. XVI., p. 90. *Arch.*, t. XV., p. 273.
- Scoutetten, 1—cancer—cured. (?) *Reverdit, Thèse, 1837, No. 85.*
- Fricke—cancer, disarticulation—cure. *Gaz. Méd.*, 1837, p. 13.
- Regnoli, 1—cancer—cured. *Jour. des Conn. Méd.-Chir.*, t. II., p. 330.
- Ulrich, 1 cure. *Bull. de Fér.*, t. IV., p. 100.
- Clot, 2 cases cured—left half. *Jour. Hebd.*, 1835, t. II., p. 293.



- Clot—cancer cured. *Compte-Rendu*, 1832, p. 50.
- Duverney—necrosis—cured. *Mal. des Os*, t. I., p. 198.
- Velpeau, 7 cases—4 deaths.—1829, 1831, 1837.
- Hetling, 1—osteo-sarcoma, disarticulation—cured. *Encyclog. Méd*, 1836, p. 104.
- Monod, 1 death. Communicated by the Author.
- Earle, 1—spina-ventosa—cured. *Encyclog. Méd.*, p. 47.
- Anderson, 2 — disarticulation — death. *Thèse de Kock*.
- another cured. *Gaz. Méd.*, 1833, p. 383.
- Textor, 2; caries. Coulon, *Thèse*, p. 28.
- Jæger, 5 disarticulations—1 death. *Thèse de Kock*, Jæger. Heine, *Gaz. Méd.*, 1834, p. 644.
- Dzondi, id. 1 death. Coulon, *Thèse*, p. 28.
- Ricord, 2 cases. *Thèse de Kock*.
- Palmi, 1—disarticulation, death. *Gaz. Méd.*, 1833, p. 647.
- Michon, 1 death. *Thèse de Kock*, 1831.
- Syme, 1. Communicated by the Author.
- Convers, 1—necrosis—cured. *Opér. cit.*
- Granger, 1—sarcoma—a woman —cured. *Gaz. Méd. de Paris*, 1835, p. 45.
- Lherminier, 1—sarcoma—death. *Ibid.*, 1835, p. 413.
- Blandin, 1—cured. Communicated by the Author, 1836.
- Percy, 1. *Gaz. Méd*, 1837, p. 671.
- Blanchet, 1—necrosis—cured. *Acad. Roy. de Méd.*, t. II.
- Langenbeck, 3 cases—2 cured, 1 death. *Nouv. Bibl. Méd.*, 1828, t. II., p. 180.
- Kuhl, 1 death. Coulon, *Thèse*, p. 28,
- Withusen, 3 cases—1 death.
- Perry, 1—necrosis—woman aged twenty years — extracted, regeneration, cure. *Encyclogr. Méd.*, 1833, p. 233.
- A. Robert, 1—cancer—death. Communicated by the Author.
- Bouyer de Saintes, 2 cases—successful (?) *Bull. de l'Acad. Roy. de Méd.*, t. III., p. 42.
- Syme, 2 new cases—1 left side, 1 middle—cured. *Edinb. Med. and Surg. Journ.*, Vol. CXXXVII., p. 382.
- Fischer, 1—from fire arms. *Textor, Neuer Chiron.*, Vol. II., p. 358.
- Baudens, 1. *Lancette Franç.*, 15 Sept., 1836.
- Mursinna, 1. *Jour. de Græfe and Walther*, Vol. IX., p. 598.
- Cappelletti, 1 woman pregnant—was two-thirds cured. *Ann. Univ. di Med. d'Omodci*, Vol. LXXXVI., p. 39.
- Ehrmann, 1—death—asphyxia. *Arch. Méd.*, de Strasbourg, No. 5.
- Schuster, 1—death—asphyxia? *Rack, Thèse*, Strasbourg, 9th of July, 1838.
- Liston, 2 osteo-sarcomas. *Jæger, Opér. Résect.*, 1832.

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| 1810—Deaderick—1 cure, exostosis.        | } | Jæger, <i>Opér. Réséct.</i> , etc., p. 1, 2, 14, 15, 16. |
| 1817-18—A. Cooper—2 cures, exostosis.    |   |  |
| 1818-24—Crampton—2 cures, osteo-sarcoma. |   |  |
| 1823—Klein—2 cures, osteo-sarcoma.       |   |  |
| 1824—Dybeck—1 return. (?)                |   |  |
| 1824—Eckstrum—1 death, osteo-sarcoma.    |   |  |
| 1825—Lizars—1 cure, osteo-sarcoma.       |   |  |
| 1827—Hodgson—1 return (?) osteo-sarcoma. |   |  |
| 1827—M. Ayl—1 cure, osteo-sarcoma.       |   |  |
| 1827—Arendt—1 cure, osteo-sarcoma.       |   |  |
| 1828—Wilhelm—2 cures, caries.            |   |  |
| 1831—Dietz—2 cases, 1 fungus cured.      |   |  |

Out of about 160 cases, there are nearly 40 deaths. Amputation of one of the sides of the jaw, though it should extend to the articulation, promises also to be an equally valuable resource in a good number of cases. It is, however, difficult to conceive that its total ablation would be actually followed by success, and permit the patient to be restored and preserve the faculty of swallowing. We can imagine that after its exfoliation, new examples of which have been related by MM. Snell and Gambini, matters might pass otherwise. The necrosed sequestrum does not separate until the system has more or less completely supplied its absence, by the creation of a new tissue, so as to render the deformity much less perceptible. We can appreciate also that the forced extraction of the sequestrum, again performed in 1830, by Dupuytren, is far from being subjected to the same operation as amputation properly so called, and that on this subject there can be no fixed process.

[M. Sedillot refers to a serious complication, not mentioned by writers, and which is liable to occur after the complete removal of the body of the lower jaw. The rami are carried forwards, inwards and upwards, by the temporal and pterygoid muscles, pressing against the alveolar arch and causing severe pain and ulceration. In two cases he observed, this accident contributed in causing the death of the patients. In such cases he recommends the entire removal of the bones, or their resection just below the origin of the coronoid process. (*Op. cit.* p. 487, vol. 1st). G. C. B.]

#### § IV.—Anterior Surface of the Bone.

If the bone should only be superficially affected, we might, as Delpech advises, and ought, in fact, not to remove its whole thickness. Should

it be a necrosis, we then lay bare the part by one of the processes described farther back; then, after having applied the handsaw or the concave rowel-saw from above downwards, to extract the third or the half, or in fact the entire table of the bone, and to remove every portion that is diseased, we reunite the borders of the wound by means of the suture. In cases of sarcoma, the portions of the lip and the soft parts of the chin which are degenerated, having been circumscribed by a V incision, should be removed at the same time with the anterior tables of the bone. Here the sides of the wound would have to be dissected and separated to some distance on each side, to be afterwards approximated and united by the suture.

### § V.—*Dental Border.*

When the degeneration does not comprise the entire vertical dimensions of the bone, as for example often happens in cases of epulis and parulis, we are not obliged to divide the whole height of the bone. I have operated upon three patients in this state.

The process which I have followed, is of easy application, and sure. If necessary, detach the inside of the lip or cheek down to the lower border of the jaw bone, without touching the skin. With a cutting instrument, in form of a cutting forceps, curved almost at a right angle upon its border, I embrace the whole tumor through the mouth, and remove it, taking care to make the section below in the sound part of the bone. One cut ordinarily suffices; but we make two or three successively, if the disease has reached to a great length along the jaw, [meaning of course the alveolar or dental border. T.] The tumor being now secured by the fingers, forceps or erigne, may be detached by a few cuts of the bistoury or scissors, should it still be retained by some bridles of the gum. No hemorrhage ensues, and no dressing is required; an astringent gargle is to be used, and that comprises all.

Dupuytren, MM. Barton, Lallemand, and A. Bérard, (*Dict. de Méd.*, t. XVIII., p. 452,) have also performed this operation, but by another process. M. Barton, by dividing the lip vertically on the middle of the tumor, in order to make a T incision reversed, by means of a lower incision parallel with the border of the jaw, formed two flaps, which were raised up, one to the right and the other to the left. He was then enabled by the saw to divide the bone horizontally, and then vertically in front and behind, upon the alveolar border, in order to complete the isolation of the tumor.

This process which I had recourse to, [the author does not, I think, mean that he first introduced it into practice. The operation had been repeatedly performed many years before in this country, at least, by Dr. Mott. T.] in the year 1831, with M. Sabatier, upon a woman sixty-five years of age, and which M. Bérard has also adopted, would not become indispensable unless the disease had proceeded to great extent, and in that case, I should at present prefer commencing with the horizontal incision rather than with the vertical incision of the integuments. As to the trephine, which M. Lallemand had recourse to, I do not think it ought to be employed in any case. All the patients treated by the process I have described, were restored; not one of them died.



§ VI.—*Lower Border.*

The diseases which sometimes render excision of the jaw necessary, may comprise only the half or two inferior thirds of the height of this bone. Here also the excision of the diseased portion only should be substituted for complete excision. A young man had an encephaloid tumor, of the size of the fist, which included the chin, and descended to the os hyoides. After having, by repeated incisions, separated it from the lip and neck, I detached it a little from the subjacent tissues. Then causing the lower lip to be raised up, I directed the saw to the root of the incisors, and removed without difficulty the whole of the chin, while leaving untouched the dental border. The patient, after presenting the promise of entire recovery, died at the end of three weeks, but there was found an enormous encephaloid abscess in the right lung, and a purulent effusion in the pleura.

The different kinds of osteotomes and rowels would also come into use here; but unless the disease should be situated rather in the side than in the projecting points of the jaw, the hand-saw should have the preference over that of M. Heine, which, on one occasion was employed with success by M. Walther, (*Gaz. Méd. de Paris*, 1834, p. 644, 645.) If the soft parts should be sound, we should form a large flap, semilunar in shape, with its lower border free, and which should be dissected up from the sub-hyoidean region, towards the face, and which would only require afterwards to be allowed to fall down in its place, in order to close up the wound. If on the other hand, however, the integuments would have to be taken away with the tumor, it would be necessary to cut around and dissect them off in such manner as to admit of our elongating their flaps, as in the anaplastic method of Franco, and to proceed afterwards in the same manner as for an ordinary anaplasty.

The advantages of these partial excisions of the jaw are too evident to require from me any further exposition of their merits. Easy and prompt of execution, simple in their consequences, rapid in their cure, and producing but a trivial deformity, are the advantages which indisputably belong to them, and which cannot be said, to the same extent, of the excision of the whole height of any part whatever of the same bone.

[*Excision of the Lower Jaw.*—M. Bégin, in a memoir, “*sur la Résection de la Mâchoire Inférieure, considérée dans ses rapports avec les fonctions du Larynx et du Pharynx*, (see Séance of the Academy of Sciences of Paris, 20th Feb. 1843, in the *Journal des Connaiss.*, &c., de Paris, Mai, 1843, p. 214,) feels himself authorized to come to the following conclusions :—

1. That after the excision of the entire jaw, the tongue, os hyoides, and larynx may be gently and gradually drawn backwards, so as to cause asphyxia after a lapse of time, at which it would be supposed there would no longer be any reason to apprehend such a result.

2. That this accident may be prevented, by fixing the os hyoides, by means of the tongue, upon a sort of artificial jaw, until nature has caused new adhesions to the parts.

3. Finally, that by abstaining from forced means of reunion from one

side to the other, and by using only simple containing dressings, which excite neither erythema in the nervous system nor retraction in the muscles, the surgeon favors the cure without exposing himself to the risk of rendering the deformity greater or more difficult of reparation.

These rules, though they might prove advantageous in extreme cases, in which the totality of the jaw on both sides is removed—cases, however, excessively rare—have never been found necessary in the practice of the American surgeon (Dr. Mott) who was the first to exsect the lower jaw for *osteo-sarcoma*, and who has performed, doubtless, more of these operations, both upon that and the upper jaw, than any other practitioner.

The entire left half of the lower jaw, in a case of *spina ventosa*, was amputated and disarticulated with a perfectly successful result, leaving little or no deformity, by M. V. de Lavacherie, professor at the university of Liege, (Belgium,) as we learn from his treatise. *Memoirs et Observations sur quelques Maladies des Os Maxillaires, &c.*, Brussels, 1843. (See also *Journ. des Connaiss.*, Paris, Juin, 1844, p. 241.) The same physician informs us that he has also performed the same operation of amputation and disarticulation of the right half of the lower jaw for *osteo-sarcoma*. This, however, ended fatally immediately after the operation, in consequence of hemorrhage, which, though it did not exceed a pint, was too exhausting in consequence of the hemorrhages which had daily attended the disease for some time. And this unfortunate result occurred, too, notwithstanding the surgeon had adopted the precaution of tying the *primitive carotid* the day before, which, unhappily, did not prevent the tumor from bleeding more or less from the time of the application of the ligature until the operation was performed on the day succeeding, and which operation, therefore, naturally terminated as has been stated. (Loc. cit., p. 242.) For extensive tubercles on the jaw, he has found compression succeed in one case perfectly.

A man aged sixty-eight, with a *spina ventosa* of the left side of the lower jaw, and who had been operated upon for a carcinoma of the lower lip six years before, had the greater portion of the left side of the jaw removed, (*Lond. Med. Gaz.*, Oct. 11, 1844,) by Dr. S. Chisholm, at Inverness, (Scotland,) in June, 1844, and recovered so perfectly that he walked home, sixty miles, two months after the exsection. The portion of bone removed, extended from the side of the symphysis to the articulation—not, as we understand, including the rather difficult and dangerous process of disarticulation of the jaw itself.

M. Blandin (*Gaz. Méd. de Paris*, Juin 14, 1845, p. 381) very recently removed, in a female, the whole left ramus and a part of the body of the jaw, as far as to the middle of the commissure of the lips on the opposite side; managing so as to save the principal branches of the facial nerve, and thus to preserve the integrity of the movements of the face. [In an operation performed by Prof. Mussey in 1845, the symmetry of the mouth was perfectly preserved by avoiding the facial nerve, his incisions having been commenced below its transit, as well as the duct of Steno. (*Trans. Amer. Med. Association*, Vol. III.) G. C. B.] In exhibiting this case to the Academy of medicine of Paris, June 10, 1845, M. Blandin expressed, apparently, much agreeable

surprise to find substituted, in place of the exsected bone, a spontaneous, fibrous, bridle-like production, which occupied nearly the whole of the space left by the exsection, and which seemed to unite the two fragments. The consistence of this bridle, he remarks, appears to be similar to that of the jaw of young infants, who have not yet breathed.

This fibrous, or rather fibro-cartilaginous substance, has long been familiarly known in this country, ever since the operation of exsection of the lower jaw was first introduced into surgical practice here by Dr. Mott. T.]

This operation of Dr. Mott, it would appear, is now become domiciliated even in India. Mr. R. O'Shaughnessy, of the Gurtharhattah Dispensary, in a treatise on the *Diseases of the Jaws, Extirpation, Amputation, &c.*, Calcutta, 1844, relates that he had then performed the operation of removal of the upper or lower jaw *five times successfully*, in one of which the osteo-sarcomatous tumor of the lower jaw was as large as a child's head, requiring the extirpation of the whole jaw on both sides, except the ramus of the left! This is close upon the heels of what civilized Europe or America can boast of. In his operations on the upper jaw, we perceive that he disapproves of the extensive incisions of Mr. Liston, but nevertheless continues upon the erroneous plan, as Dr. Mott conceives it to be, of making his incision extend from the zygoma into the centre of the commissure of the mouth, instead of the straight single and simple perpendicular incision of Dr. Mott, from near the inner angle of the eye and along the ala of the nose into the mouth, near the median line of the upper lip. Mr. O'Shaughnessy prefers, however, to make all his exsections with Mr. Liston's bone nippers, using the saw only to divide the malar process where the malar bone may be saved. T.]

[Dr. Hüllihen, of Wheeling, Va. has successfully applied Barton's plan of exsecting a wedge shaped piece of bone, to remedy deformities, in a case, where in consequence of the distortion produced by an extensive burn upon the neck and lower part of the face, the lower jaw had become "bowed slightly downward, and elongated, particularly at its upper portion, which made it project about an inch and three-eighths beyond the upper jaw. This lengthening of the jaw had taken place entirely between the cuspidatus and first bicuspid tooth of the right side, and between the first and second bicuspids of the left." A wedge-shaped piece of bone was removed from between the abnormally separated teeth, and then by bringing the cut surfaces, on each side together, the jaw was restored to its proper length. The full report of this case, with illustrative drawings, may be found in the *Phil. Med. Examiner*, March 1850, or an abridgment of it in the third American edition of Mr. Miller's *Principles of Surgery*, by Dr. Sargent, p. 399. G. C. B.]



## DR. MOTT'S CASES OF EXSECTIONS OF THE LOWER JAW.

No I., 1821; Nov. 17th and 18th.—CASE OF OSTEO-SARCOMA—in which the right side of the lower jaw was removed successfully after tying the Carotid Artery. By Valentine Mott, M. D., Professor of Surgery in the University of New-York. (See *New-York Medical and Physical Journal*, Vol. I., No. 4; Oct, Nov., and Dec., 1822, p. 385—364. Four plates.)

Catharine Bucklew, the subject of the following operation, was an interesting young woman, aged about seventeen years, of a healthy appearance and good constitution.

She says that about two years since, a swelling commenced behind the last molar tooth of the lower jaw, attended with acute pain about the angle of the jaw, that continued about three weeks; at which time it left her without any evident resolution of the inflammation. At this period there was no inflammation of the integuments, nor could any pus be discovered either on the cheek or about the bone within the mouth. Some domestic applications were made to the cheek, but the tumefaction continued to increase, and assumed a smooth, hardy, and bony character.

About twelve months after its commencement she applied to a physician in New-Jersey, who advised her to apply blisters to the cheek, and the use of topical applications of caustic to the tumor, together with a general antiphlogistic constitutional treatment. After having submitted to this course for two months without experiencing any benefit, she came to this city, and became my patient.

The first molar tooth came away early in the disease, and the second soon followed; then, three or four of the other teeth of that side of the lower jaw. She states, that previously to this disease she had never had a decayed tooth.

No fluctuation was to be felt at any time in the tumor. She had no constitutional symptoms as the effect of this disease, nor any inordinate headache on that side. The lymphatic glands of the neck were however swollen, during the continuance of the inflammation in the early part of the disease; but they disappeared as soon as the pain subsided.

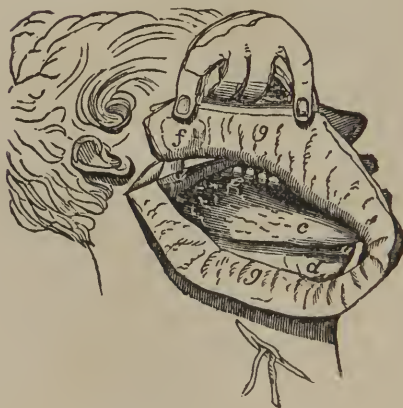
When she came under my care, the tumor extended from the root of the coronoid process to the second bicuspid tooth, elevated nearly an inch above the level of the teeth, and spreading considerably wider than the alveolar process. Its appearance was smooth, and to the touch somewhat elastic, though firm. An incision on each side of the alveolar margin, with a scalpel, enabled me pretty readily to remove the tumor with a gum-lancet to the level of the jaw-bone. The tumor, on examination, contained many cartilaginous and osseous spiculæ, and in the substance of it was imbedded one of the molar teeth in a perfectly sound state.

About three weeks after this operation a small portion, of the size of a nutmeg, which had granulated and grown rapidly, was taken off, and soon after she retired to the country, and remained in a very comfortable state for several months. The tumor began now to re-appear, and continued to increase gradually in every direction.

[Plate 1.]



[Plate 2.]



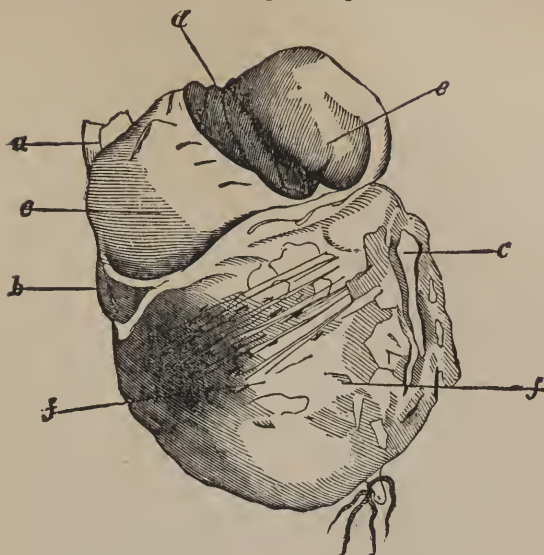
No. I.

This drawing exhibits the appearance of the face before the operation was performed. The rotundity of the right cheek will be observable, and the integuments below the under eye-lid, on the stretch from the size of the osteo-sarcoma.

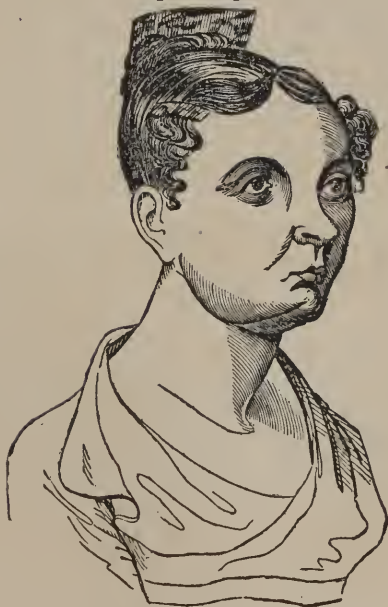
No. II.

Represents the side of the face after the tumour was removed, and before the parts were closed. *a* The part at which the jaw-bone was divided near the chin. *b* Condylod process, where separated by the saw; the coronoid process being drawn up by the temporal muscle. *c* The side of the tongue. *d* Sub-lingual gland. *e* Molar teeth of the right superior maxilla. *f* Inferior portion of the parotid gland, with a plane of fibres of the masseter muscle turned up. *g g* Portions of the common integuments.

[Plate 3.]



[Plate 4.]



No. III.

This figure exposes the appearance of the tumour upon the inner surface. *a* Cuspidatus and first bicuspid teeth. *b* Lower jaw where divided anteriorly. *c* Bone at its posterior division. *d* Furrow produced by the teeth of the upper jaw. *e e* Two superior portions of the tumour covered by the membrane of the mouth. *f f* The remainder of the inner surface of the tumour, dissected from the parts within the mouth.

[No. 4.]

The appearance of the patient after her recovery.



The tumor, at present, (Nov. 10th, 1821,) has the same firm and slightly elastic feel which characterized it in the early stage, involving all the right side of the inferior maxillary bone. Projecting outwards, it produces great convexity of the cheek: upwards it divides into two portions, the outer and longest reaches up to the *os malæ*, and between the two is a considerable furrow, formed by the teeth of the upper jaw, which occasions an abrasion and constant discharge; the latter, though offensive, does not appear to be acrid or irritating: downwards it comes nearly in contact with the thyroid cartilage; inwards it extends beyond the middle line of the mouth, pushing the tongue and uvula very much to the left side, having the *velum pendulum palati* of the right side attached to it in its whole course. The inward portion is considerably raised above the level of the tongue when the mouth is opened.

The posterior extremity of the tumor has encroached so much upon the passage leading into the posterior fauces, and the pressure of the lower parts upon the larynx is so considerable as to render deglutition very difficult; and from the great difficulty of mastication, she has been compelled for some time to subsist upon liquid aliment. Her speech is considerably interfered with in consequence of the displacement of the tongue. She experiences no pain in any part of the tumor.

The gradual increase of the disease rendering mastication and deglutition more difficult and distressing, she is very desirous of knowing if an operation could not be performed which might extend to her some chance of life; observing, that with the constant growth of the tumor, such as has taken place for a few weeks past, she would not be able to swallow anything in a short time. Fully aware of the dangerous nature of the novel operation her case requires, she is determined to submit to it, and hazard the consequences: the uncertain result of which I carefully explained to her, and informed her, that she might die during the performance of the operation; but that I believed it to be both practicable and proper.

After preparing the system for about a week with light diet, and the exhibition of several doses of neutral salts, to obviate any great degree of inflammation, the operation was commenced about 11 o'clock on the morning of the 17th.

As most of the important branches of the external carotid artery would be interfered with in the course of this operation, I believed it most prudent to pass a ligature around the primitive trunk as a first and preparatory step. This would not only enable me to go through it with more safety to the patient, but appeared the most important of all means to avoid inflammation. Indeed, inflammation was much to be dreaded, from the immense extent of the external incision, and the violence which would necessarily be done to the tongue, palate, and pharynx.

From these considerations, I felt it doubly important to intercept the current of blood through the common carotid, and from what I had observed to attend the application of ligatures to the large arteries of the extremities, in cases of severe injuries, by preventing inflammation, I thought great advantage would attend it in this case, as I am satisfied will be fully shown.

An incision about two inches and a half long was made a little below the thyroid cartilage on the inner edge of the *sterno-cleido-mastoideus*

muscle, and after exposing the carotid, a single ligature was passed under it and tied. It was deemed most proper to tie the carotid, in this situation, in order to prevent the second part of the operation from interfering with the first incision. Very little blood was lost, and only one small cutaneous branch at the lower angle of the wound required a ligature; yet she became pale and almost pulseless during, and immediately after, the operation, notwithstanding her position was recumbent. She submitted to the operation with great firmness and resolution, but her mind soon became agitated and perturbed to a great degree, and it seemed altogether impossible for her to regain her former fortitude. The operation was suspended, and some cordial was administered, but it failed to remove from her mind the presentiment that any further proceeding at present would be fatal. In this state of remarkable agitation I resolved not to proceed, and informed her that with such fears as she then entertained, the result was to be dreaded. The wound was then dressed, and she was put in bed, faint and exhausted.

After recovering a little, I apprised her that this was only preparatory to the most important part of the operation, and that what had been done would prove of little or no benefit to the disease, and urged her seriously to consider of it, and if possible make up her mind to submit to the performance of the remaining part, which should by no means be deferred longer than the following day.

One o'clock, P. M.—She is still pale, and in a cold sweat; pulse has not recovered itself; and when asked, nodded that she felt some uneasiness.

Seven o'clock, P. M.—Much more collected; pulse natural; no uneasiness whatever, except some obtuse pain about the wound in breathing, and in swallowing saliva; no increase of heat; left a student to watch with her through the night, and again took leave, earnestly recommending to her private consideration the expediency of submitting to the remainder of the operation.

18th.—Seven o'clock, A. M.—Found her this morning in a very composed state of mind; having slept well, and free from fever. Upon putting the question, would she submit to the remainder of the operation? she nodded assent with much apparent decision, and said she was determined to undergo it.

At ten o'clock, finding my patient cheerful and resolute, she was again placed upon the table, and in the presence of Wm. Anderson, surgeon, the late Dr. Hosack, and a number of other gentlemen, the operation was continued. Feeling for the condyloid process, an incision was commenced upon it, opposite the lobe of the ear, carried downwards over the angle of the jaw in a semicircular direction along the lower part of the tumor, as it rested upon the thyroid cartilage, and terminated at about half an inch beyond the angle of the mouth, on the chin. The termination of this incision upon the chin, was just above the attachment of the under lip to the bone, and the mouth was thereby laid open. I now extracted the second incisor tooth of that side, as it was in a sound part of the bone, and, after separating the soft parts from the side of the chin, and laying bare the bone, I introduced a narrow saw, about three inches long, similar to a key-hole saw, from within the mouth, through the wound, and sawed through the jaw-bone from above down-

wards. The lower part of the tumor was then laid bare, by cutting through the mylo-hyoid muscle, and the flap of the cheek carefully separated and turned up over the eye. This exposed fully to view the whole extent of the tumor as it rose upwards to the os malæ. After the integuments were carefully dissected from the parotid gland, the masseter muscle was detached from its insertion, until it came to the edge of this gland, then separating a thin plane of the fibres of this muscle, I now readily raised the parotid, without wounding it at this part. The maxilla inferior was now laid bare just below its division into two processes, and it appeared sound. To facilitate the sawing of the bones, it was necessary to make a second incision, about an inch long, close to the lobe of the ear, and terminating at the edge of the mastoid muscle; then with a fine saw made for the purpose, smaller and more convex than Hey's, I began to saw through the bone, obliquely downwards and backwards, and finished with one less convex. The latter part of the sawing was done with great caution, to avoid excruciating pain from the laceration of the inferior maxillary nerve. When the bone was sawed through, the two processes were observed to be split asunder, and the coronoid to be drawn up by the action of the temporal muscle.

An elevator was now introduced where the bone was divided at the chin, by which the diseased portion was raised, when, with a scalpel passed into the mouth, the tumor was separated from the side of the tongue, as far back as the posterior fauces, from the velum pedulum palati and pterygoid processes. This loosened it very much, so that it could be turned upon the side of the neck. It was then separated from the parts below the base of the jaw, and also from the pharynx, and detached at the posterior angle, carefully avoiding the trunk of the internal carotid and deep-seated jugular vein, both of which were exposed.

The diseased mass, being now separated above and below, was turned up, the pterygoid muscles detached, and the third branch of the fifth pair of nerves divided from below, a little above the foramen at which it enters the bone. By this manner of proceeding, with a constant reference to this nerve, I apprehend my patient was saved from much acute pain, and the nerve more safely divided, than at an earlier stage of the operation.

At several periods of this operation, the curved spatulas, used in my operation upon the *arteria innominata*, were found very useful, particularly in elevating the parotid gland, and keeping the tongue steady, whilst the tumor was being separated from it.

Very little blood was lost during this operation. Two arteries only of any size were divided, the facial and lingual; and these only required the ligatures at the branch extremities; but each end was tied for safety. Another small artery behind, and a little underneath the posterior angle of the jaw, yielded some blood and was tied.

The flap of the cheek was now brought down, after waiting a few minutes to observe if any hemorrhage should come on, and secured in close apposition by three sutures, and adhesive straps. Lint, a compress, and the double-headed roller, completed the dressing. She was made as comfortable as possible upon the table, and directed to remain a few hours to recruit, and to be more convenient in case any hemorrhage should make it necessary to remove the dressings.



At eight o'clock in the evening, I found her removed to a bed, and in a comfortable situation. Some reaction of the circulation had taken place, but there had been no hemorrhage. The pain from the operation, she said, was less than she expected. For the first time, since the operation, she sipped three tea-spoonfuls of cold water, and gave evidence, by a nod, that she could swallow. Directed one hundred drops of tinct. opii to be given, if any twitching, more pain, or restlessness, should supervene.

19th.—Seven o'clock, A. M.—Found her quite free from fever and irritation, and, in every respect comfortable. Swallows cold water by the tea-spoonful with but little inconvenience. Did not take the tinct. opii last night. Slept several hours during the night.

Twelve o'clock, at noon.—Is comfortable; skin moist; pulse less frequent, and soft; directed an enema to be administered of soft-soap and water; has a little more difficulty in swallowing, but none in breathing.

Nine o'clock, P. M.—As well as in the morning. Enema operated three times, and relieved her. Pulse frequent, but not tense. She has taken about two ounces of cold water by the tea-spoonful since daylight.

20th.—Seven o'clock, A. M.—Had a very comfortable night. This morning, instead of nodding, she answers "yes" and "no" to the several questions in an audible whisper.

Nine o'clock, P. M.—Much as in the morning.

21st.—Nine o'clock, A. M.—As comfortable as yesterday morning

Nine o'clock, P. M.—No material alteration.

22d.—Nine o'clock, A. M.—Directed an enema to be administered as before. Allowed her to take, in addition to her cold water and teas, some thin chicken soup: is in every respect doing well.

Nine o'clock, P. M.—Tumefaction of the lips and cheek very trifling, not enough to effect the least change in the eye-lids of the right eye.

23d.—Is in every respect comfortable.

24th.—Eleven o'clock, A. M.—Makes no complaint; dressed the wounds; union by adhesion has taken place in the whole extent, excepting about the ligatures and sutures. Suppuration having come on about two of the sutures, they were removed. Pulse about 120. Renewed the adhesive straps with lint interposed between them and the wound, and the double-headed roller.

25th.—Every way comfortable. Pulse 120.

26th.—Says she has no complaint to make. Pulse 80. Directed her to take a small dose of sulphate of magnesia.

27th.—Speaks audibly, and says she is very well. Pulse about 84.

28th.—As well as before; dressed the wounds; removed the two sutures at the upper part near the ear; wounds appear healed at every part, except where the ligatures remain upon the arteries. Pulse 80.

29th.—Feels very well; speaks distinctly; takes freely of soup and other thin food. Pulse 100.

Dec. 3d.—Ligature from the carotid came away, and the other three ligatures from the upper wound. A small collection of matter was evacuated from under the integuments in the lower wound, which was produced by the irritation of the ligature.

4th.—Speaks and swallows very well; wounds just healed. Has

used for some days a wash of spirits and water to the mouth, with a view to correct some factor of the saliva, and cleanse the mouth.

6th.—Found her dressed and sitting in an adjoining room, reading by the fire; looks and says she is very well. The bandages being all left off, the only deformity apparent is a little more tumefaction of the right cheek than the left; wounds just well; can move very readily the sound half of the under jaw. Permitted her to chew some animal food.

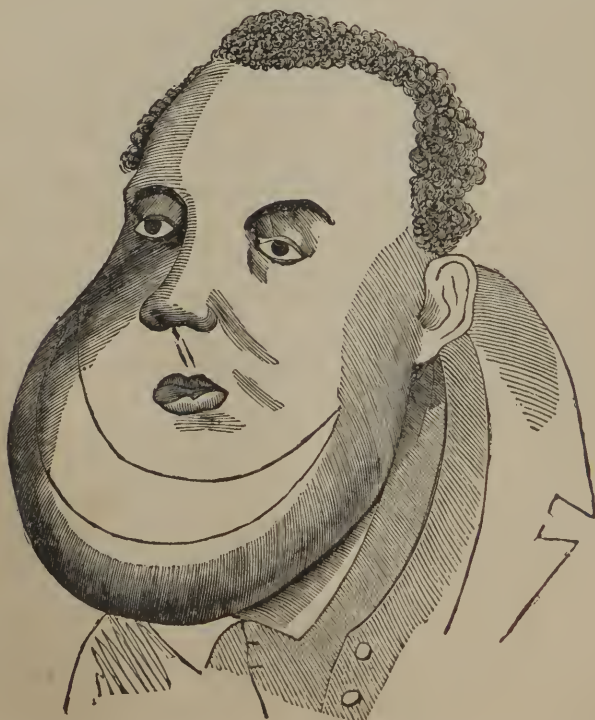
10th.—Wounds all healed; makes no complaint.

March, 1822.—To-day having visited her, I found scarcely any perceptible deformity. The right cheek appeared, upon close examination, to be a little more depressed than the left. I felt from within the mouth some osseous deposit to have commenced at the two situations at which the bone was divided. Her health in every respect is perfectly good, and she enjoys the free use of the left side of the lower jaw.

Nov. 5th.—I have repeatedly heard of and seen the patient during the past season, and she continues to enjoy uninterrupted health.

No. II.—MAY 15, 1823. CASE OF EXSECTION AND DISARTICULATION OF THE LOWER JAW IN THE NEGRO MAN PRINCE, (See New York Medical and Physical Journal, Oct., Nov. and Dec.; 1823; Vol. II., p. 401-405. *One plate.*)

In this case the disease was of prodigious magnitude, and the bone removed at the articulation on the right side.



Prince, a colored man, aged eighteen years, was sent me from New Jersey, with an *osteo-sarcomatous* tumor, embracing the lower jaw-bone from the articulation of the right side, as far as the alvcolar socket, supporting the first molar tooth of the left. It presented an appearance in size equal to that of his head.

At the age of twelve an enlargement of the bone showed itself about the situation of the second molar tooth of the right side. This was at first considered a gum-bile, but it gradually increased, dislodging one after another, the teeth in its neighborhood. When it had arrived at the size of a walnut, a lancet was put into it, but no pus or fluid issued. In 1818, when as large as a goose-egg, it was again opened, and a small quantity of blood and matter was discharged. During its progress it was slightly painful, until some time before the operation, when it became the cause of much uneasiness. Latterly two or three small openings had taken place within the mouth, attended with a discharge of pus and ichor, by which were denuded several bony spiculæ. Externally, near the most depending part, an ulceration of the skin had taken place, from which had been discharging daily for some weeks several ounces of thin matter, and through which a probe would readily pass to some distance into the substance of the tumor.

The size of the tumor in the mouth was such as to reach completely over to the left cheek, carrying the tongue along with it, so that the latter lay flatwise between the tumor and the cheek. Deglutition was extremely difficult, and confined to liquids in small quantities. These glided along between the tongue and left cheek, when the head was very much inclined to the left side. No appearance of fauces could be observed upon opening the mouth.

From the long continuance of this disease, and the great emaciation which attended it, very little hope could be entertained from so formidable an operation as would be required for the removal of such an enormous mass. Still, as I knew he would soon perish with it, and being very desirous himself to take what little chance there was, I determined to give it him, and accordingly performed the following operation:—

May 15th, 1823.—At noon of this day, I tied the right carotid artery, a little above the clavicle. He bore the operation with great firmness, and appeared to be but little exhausted by it. After resting and refreshing himself with a little wine, he wished it to be continued.

An incision was now commenced at the lower edge of the *jugum temporale*, and carried in a semicircular direction over the most prominent part of the tumor, and terminated opposite the first molar tooth of the left side. Another incision of the same form, but of less extent, below this, left a large piece of integument in which was situated the ulceration. (*See Plate.*) The flaps being dissected from the tumor, the second bicuspid tooth of the left side was extracted, and the bone here sawed through at a sound part, with the saw which I had provided for the other cases.

Raising with an elevator the bone where sawed through, the diseased mass was cautiously dissected from the tongue, palate and pharynx, until the joint upon the right side was exposed; the capsular ligament was now divided on the inner side, by which the bone was easily removed from its articulation. In the course of this part of the operation



very little blood was lost, it being necessary only to apply four ligatures. This would seem to answer in the negative the query put in the former case concerning hemorrhage.

The patient was much exhausted by this operation, which, from the great extent of the disease, necessarily occupied a considerable time. His exhaustion was also to be ascribed to his previous state of debility.

After his recovery from the exhaustion the flaps were brought together by several interrupted sutures and adhesive plasters, and the double headed roller being applied, he was put to bed.

The tumor weighed *twenty-two ounces avoirdupois*.

Three o'clock.—Has continued to recover gradually from the shock of the operation.

Five o'clock.—Fell into a sleep of about half an hour, and has awaked much better. Pulse regular and distinct.

Eight o'clock.—Pulse 140, and regular; skin cool and moist; signifies by a nod that he is more comfortable than he expected to be. Has spoken pretty distinctly for several things, contrary to particular orders; swallowed some water from the spout of a tea-pot without much difficulty. Requested two pupils to remain with him during the night.

10th.—Ten o'clock, A. M.—Slept most of the night quietly, only taking a little cold water once; skin of the natural temperature; pulse 120, and stronger than last evening. Nods that he is much more comfortable; ordered him to take a little cold water occasionally when necessary, but to take it as seldom as possible.

Ten o'clock, P. M.—Pulse 124, and fuller; skin pleasantly warm; articulates that he is quite comfortable, and feels refreshed from his sleep; has had considerable sleep through the day, and is now sleeping very quietly. Swallows very well when the fluid is conveyed into the posterior fauces by an elastic tube and bottle. He introduces the tube himself as far as is necessary, for the purpose of swallowing without producing any action of the lips or muscles of the face. Contrary to orders, got out of bed to have an evacuation from his bowels and pass urine, which he accomplished without difficulty.

17th.—Ten o'clock, A. M.—Has had a good night; pulse 120; skin nearly natural; swallows with more difficulty, and some of the liquid passes through the wound. Removed the bandage and adjusted all the dressings anew, as they had become wet. Takes soup and chocolate as his drink; bowels have been moved again spontaneously; has a slight cough.

Nine o'clock, P. M.—Says he is as comfortable as in the morning; pulse 124; has slept a good deal in the course of the day, and says he feels much strengthened by it.

18th.—Ten o'clock, A. M.—Passed a good night, and says he is quite as well as yesterday; swallows better; pulse 130.

Ten o'clock, P. M.—Not as well as in the morning; pulse from 135 to 140 in a minute; coughs more frequently; respiration considerably hurried; is very restless, and feels very faint at times. In the course of this afternoon, during a very heavy thunder-shower, he fainted, and appeared to be threatened with immediate dissolution; but after a short time revived, by the use of volatiles and fanning; says he feels considerable pain on the left side, which prevents him from taking a full in-

spiration ; indeed, every breath is painful, as is evinced by the distress of his countenance. Ordered a blister to be applied immediately to the side.

19th.—Ten o'clock, A. M.—Is much relieved by the drawing of the blister ; slept a good deal during the night ; had one fainty turn in the course of the night. Dressed the wound this morning ; more than two thirds of the wound had united by adhesion ; breathing much better, pulse from 132 to 140 ; cough less troublesome ; swallowed some chocolate very well.

In the course of the day his cough and breathing became more troublesome, with great anxiety and restlessness ; and at four o'clock in the afternoon, in one of his turns of faintness, he expired.

Not being able to attend to the dissection, I requested my friend, William Anderson, Esq., Surgeon, to examine the body the next morning : who has obligingly handed me the following particulars :

"The wound appeared healthy, and had united by adhesion through most of its course.

"*Dissection.*—Upon raising the sternum, there was found in the anterior mediastinum a massy deposit of coagulable lymph through its whole extent. This was of a yellowish hue, having the exact appearance of pus, but wanting its fluidity. In the cavity of the pericardium was contained a pint of yellow serum, and each lung exhibited marks of high inflammation throughout their whole extent, the surfaces of both being of a deep purple, and in some places of a florid hue. There was, however, in no place any adhesion between the lungs and the sides of the chest."

#### EXSECTION AND DISARTICULATION OF THE ENTIRE HALF OF THE LOWER JAW. By *Dr. Mott*, at New-York, Nov. 23, 1844.

The operation was performed between 1½ and 2½ P. M. Saturday, Nov. 23, 1844. The patient, a young gentleman by the name of William Edgar Baker, native of, and clerk in a respectable mercantile firm in this city, and aged 25 years, was stout, of rather thick set frame, full sanguine temperament, florid full face, broad neck and chest, but dark hair and eyes, and altogether inclined to embonpoint.

About a year since, his uncle told me, Mr. Baker complained of pain in the right side of the lower jaw which soon began to swell and so continued until it reached its present magnitude—being apparently a uniform enlargement of the whole of the middle part of the base of the jaw on that side which, with the induration of the superincumbent tissues, periosteum, aponeurosis, fasciæ and muscles, gave it to the eye and feel the form of a spindle-shaped, consolidated, and apparently almost boney or semi-cartilaginous tumor throughout, perfectly unyielding to pressure, and about *three inches* through in its transverse diameter, or that through its middle, and *five to six inches* in its longitudinal diameter or that in a line with the base of the jaw, tapering each way as it reaches the angle of the jaw at one end and near the symphysis of the chin at the other.

Dr. Mott, the first surgeon who accurately described and attempted the formidable operation of exsection of a part or of the whole half or

more of the lower jaw as the remedy for this insidious and formidable disease, and who pronounced this case to be one of the same kind as the twelve to fifteen others for which he has operated upon during the last *twenty-six years*, denominates it *osteo-sarcoma*, which left to itself terminates in a malignant morbid growth of the osseous and other structures implicated, finally resolving itself into an open carcinomatous ulceration, caries, and destruction of the parts. He does not pretend to assign any particular cause for this malady. In the present case the uncle told me young Baker had, as indeed his whole appearance, complexion, frame, &c., indicated, enjoyed the most perfect and robust health from his infancy. He had never known him in fact to have suffered from any disease, and he had never had any affection whatever, except that some months back he had been attacked with a slight *erysipelatous inflammation* in one of his legs—I think he said in the calf, which, however, soon subsided without ending in suppuration or ulceration as one might have imagined it would have done, as a natural drain in a person like this patient evidently inclined to a rather gross and plethoric habit.

I asked him particularly if the erysipelas had ever attacked his face and head in the form of *St. Anthony's fire*, as I could readily conceive that in the form of *angioleucite*, involving, as it does, the thick, muscular, and aponeurotic and periosteal tissues and the bones themselves at the base of the cranium, causing distressing pain and tension of those parts, this serious variety of erysipelas (so well described by M. Velpeau in Vol. I. of this work) might result, especially when abundant sanguineous and cathartic depletion had not been made use of, in precisely such a disease as this osteo-sarcoma.

But this patient had also been particularly abstemious and temperate, though not (his uncle said) a tetotalter, or not at least as to food. It was very evident that he had not much stinted himself in good eating. There may be something of *hereditary* taint in this case, as the father had been operated upon also for an osteo-sarcoma of the upper jaw some years since.

*First Stage.*—In all those severe cases requiring extensive exsection of the lower jaw, Dr. Mott has laid it down as a principle, (See our Notes to Velpeau's Operative Surgery, Vol. I.) to take up the primitive carotid as a preliminary and indispensable step, in order to cut off the dangerous hemorrhage which would otherwise ensue from its principal branches.

Accordingly, he proceeded to apply a ligature upon this vessel, an operation in which he is so practised, (this making, I think, the 22nd time of his applying it,) and which at the time he first performed it in this country was itself deemed one of very considerable importance, but now, as is seen, made by him who *first* projected it as indispensable in the exsection of the lower jaw, a mere appendage to this operation and one of very subordinate character.

With great rapidity of manipulation, he made at once with the convex-edged scalpel (convex bistoury, as the French call it) a deep incision of about *two and a half inches* long, entirely through the whole thickness of the integuments, platysma myoides and cellular tissue, and which was so neat, perfect and complete in itself that it immediately exposed the entire aponeurosis of the inner edge of the sterno-cleido-



mastoid muscle close and parallel to which inner edge and comprising nearly the whole of the region of the middle third of that muscle, this incision had been made.

As soon as this was made by Dr. Mott, a few movements of the blunt flat handle of the scalpel quickly separated the tissues so as to reach the sheath of the primitive carotid, under which in a few moments more he insinuated the American blunt artery hook armed through the eye at the extremity where it is screwed on to the stem of the instrument, with a strong twisted double silk ligature. As soon as the blunt end of the hook could be made to work its way through the connecting fibro-cellular tissues so as to be felt and seen on the inner side of and close to the artery, the surgeon unscrewed this curved portion from the stem by some few turns of the handle, and then drew the curved portion out, leaving the artery above the ligature clearly identifying the vessel by its size, pearly color and distinct strong pulsations, and after ascertaining that it was cleanly separated from its attachments, it was firmly tied and the threads left uncut.

This preliminary operation consumed only about *fifteen minutes*. The patient was then allowed to rest awhile—not however longer than ten or fifteen minutes more, which would scarcely be called a *stage* or *premier temps*, though I have for convenience so denominated it.

*Second Stage.*—The surgeon now proceeded to the principal operation, the first step of which consisted in the *free, bold, curvilinear incision*, which as the tumor was on the right side, was made with the left hand. This curvilinear incision he was the first to project in these operations upon the lower jaw, as he was the first to project the operation itself of exsection of this jaw for osteo-sarcoma.

This incision, which was of great length, commenced at the jugum, in front of, and about opposite to, the meatus auditorius externus. It was then carried downwards over the most bulging part of the tumor behind the angle of the jaw, and thence continued along the lower part of the tumor, in a semicircular direction, was brought suddenly upwards by a short curve, and terminated upon the chin, within an inch of the margin of the lower lip, so as to open into the mouth, opposite the incisor tooth adjoining the cuspidatus—and so as to preserve completely and leave intact the commissure of the mouth. This incision is the one which Dr. Mott adopted, in his very *first case of exsection* of the lower jaw, in a young lady of this city, in 1821, (See *supra*,) and one great object he then had in view was to save the face on the agglutination of the borders of the wound, as much as possible from deformity; which it effectually did, besides being by far the best kind of incision for these cases, as the *convex* border when freely dissected upwards, forms thereby a flap of a semicircular and oval shape, which when cicatrization takes place conceals the line of the wound below the base of the jaw. This flap also by being turned up during the operation is out of the way, and gives a more ready access to the subsequent steps of the operation. The shape of the whole incision in this case was as near as could be, that of a long blunt hook, (mounting upward at the termination of its point near the lip,) lying obliquely downward and inward, *i. e.*, diagonally on the side of the neck, with its curve, the longest portion corresponding to the straight stem of the instrument, and the shorter or

more curved portion in front, constituting more properly the hook itself. Without the least delay, the surgeon now proceeded to dissect the flap upwards until finally it was detached from the tumor above. This opened into the cavity of the mouth and laid bare the masseter muscle. The next step was carefully to determine the extent of the tumor forward upon the chin. This being ascertained, by dissecting the soft parts from the chin a little way until the bone appeared sound, the incisor next the *caninus* was extracted. Room was next made by detaching the soft parts below the base of the jaw, near the chin, and from within the mouth, so as to enable a probe to be introduced from within the mouth, and brought out below, by which a chain-saw was introduced below the bone, and the jaw sawed through from below upwards. The tumor was now dissected along the side of the tongue and from the pharynx. As the dissection progressed, the masseter was carefully detached from above the tumor, where it was sound, so as to preserve this sound and upper portion of the muscle, the lower part where it was attached to the tumor, being in a diseased state and of course removed with that mass. The excised end of the divided diseased bone in front, afforded an excellent purchase for the hand, and the surgeon after resting, (at the request of the patient,) a few moments, proceeded to detach completely all the remaining adhesions of the sound portions of the tissues and connections both above and below and as near the jaw as could conveniently be done, without leaving unremoved any of the degenerated structure. This diseased mass was thus isolated as perfectly as possible.

A number of arterial branches were here necessarily divided, and the hemorrhage in consequence exceedingly profuse, notwithstanding the ligature on the primitive carotid. Dr. Mott, in reflecting upon this curious phenomenon, and the one not perhaps less so, that in two cases where he rested 24 hours between the tying of the carotid and the excision of the bone, he found comparatively speaking, no hemorrhage whatever, considers that the first could be in part explained in this manner. When the operator after the ligature on the carotid, as in this case, proceeds at once to the dissection and excision of the bone from its connections, the *distal portions* of the cut branches of the primitive carotid not having had time to contract or collapse, as it were, are yet loaded with blood, from the great vascularity of this neighborhood, and the current which has been for so long a time setting into and upon the diseased growth. They therefore still retain their abnormal diseased calibres, several of them in fact which would scarcely be noticed, if they possessed only their normal size, appearing as in this patient to have attained the diameter of a *crow-quill*, as for example, a branch of the internal maxillary, and one that a surgeon who was present thought, (erroneously however Dr. Mott thinks,) a branch of the superior thyroid.

The consequence is, that on dividing these branches and ramuscles there spouts from them a strong, forcible, and continued stream, but not *per saltum*, as from other arterial vessels, because the *vis à tergo*, in consequence of the ligature on the primitive trunk, is now cut off. This steady, powerful, and voluminous stream, which in several spurted with great force to the distance of 6 or 8 feet, spattering to a considerable

extent the operator and his assistants, is calculated to excite considerable surprise at first. Dr. Mott's explanation is this, that the cut branches are acting not only under a certain portion of their inherent and natural contractile power, but under that of a reflux *venous current into them*. Whereas, when an interval of 24 hours has taken place after the ligature has been placed upon the carotid, its distal branches, *i. e.*, those above the point of arrestation of the blood have had time to contract in proportion as the blood in those channels gradually passes from them into their corresponding veins, in its onward course to the heart. The calibres have then, as it were, time to be effaced by the natural systole of the artery, the walls themselves of the vessel probably (as some late experiments would prove,) becoming partially agglutinated by the exudation of a plastic lymph.

We think this explanation both plausible and philosophical. Yet Dr. Mott prefers to proceed at once to the exsection, immediately after the ligature on the artery, because it makes one operation, and therefore avoids the increased danger of a double operation, and because it is better to accomplish the object in view at once, if the nervous system will admit of it. In four cases however, Dr. Mott says he has tied the carotid on one day, and on the next, removed the jaw, and in the greater number of cases he has performed both operations on the *same day*. He is well satisfied that the hemorrhage is less when the artery has been secured the day before the bone is removed.

Having left the isolation of the coronoid and coracoid processes of the jaw and the disarticulation of the jaw itself as the last step in this formidable operation, the surgeon, from the loss of blood and the necessarily painful nature of the extensive dissections that had been made, (though this singularly heroic youth, as all remarked, scarcely ever winced, or moved, or twined a fibre of his face or uttered even a sigh,) thought it best now to rest for a few minutes.

*Third Stage.*—Some 15 to 20 different vessels having been now tied, in the course of the operation, and one of the lymphatic glands having been wholly removed, and the parotid divided in its whole length where the commencing extremity of the incision had passed over it, Dr. Mott proceeded with great caution and firmness to separate the extremity of the coronoid process from the close attachment of the fibres of the temporal muscle inserted upon it, and finally completely unbridling it from beneath the zygoma, reached in the same manner by a firm, steady and rapid dissection close to the surface of the bone, the neck, and finally the articulating surface of the condyloid process and that of its socket, the glenoid cavity, immediately in front of the meatus externus of the ear, in doing which he was particular to carry the knife close to the bone, until he reached the articulation. This may be considered an important step to be observed by every operator, in order to avoid wounding the internal maxillary artery. In the course of these dissections the trunk of the portio dura nerve was also necessarily divided as well as many smaller nerves and vessels.

In separating the branches of the lower jaw from its connections about the temporal bone, it may easily be conceived that not only considerable strength in the fingers and knife are required, but also great care in the movement of the instrument, for even when held as flatwise



and close as possible to the surface of the bone from which the firm fibrous and periosteal adhesions are being detached, it would be a very easy thing for its edge to sever by some slight slip of the blade, some of the important vascular and nervous trunks in the immediate neighborhood, as for example, the internal maxillary, as just stated.

It is a singular fact that the only time at which I could observe that this patient, (whose cool moral courage astonished all present,) uttered an audible moan was on placing the ligature upon the inferior dental artery. The pain must have arisen from comprising some small filament of nerve in the ligature, though care had been taken to exclude the inferior maxillary nerve from the ligature. As soon as the operator had reached the articulation of the jaw the capsule of the joint was speedily divided, and the whole bone down to its exsected extremity instantly removed, together with all the diseased tissues upon it. The patient now presented in truth a frightful appearance, yet he was calm, still and collected through the whole of this trying scene. Nor can we suppose that the wine or brandy and water which he occasionally took during the operation, and which had now lasted over an hour, had contributed to give him any artificial power of enduring such agony of pain as he must have felt, with such unparalleled sang froid and serenity. Before the operation in fact, he took only 20 drops of Magendie's solution of morphine, and a very little wine and water. He was fully conscious and sensible through the whole of it, until the enormous cavity, and destruction of parts was made in the side of his face and head, appearing like some terrible wound, or as if the operator had been dissecting a human being alive and cutting his throat, he continued to talk composedly, and to reply with the utmost coolness possible to every question put to him. The appearances now it would be difficult for any but an artist to depict.

The enormous wound, exposing the tongue, upper-jaw and fauces and right side of the throat up to the styloid process of the temporal bone, was now thoroughly sponged out with warm water, and a thin compress wet with warm water, and of sufficient size, placed over the raw surface, and the flap brought down nearly upon it, while warm dry cloths were gently applied outside over the whole; all which was judiciously done by the operator, in order to know the worst of any concealed hemorrhage, and to encourage it to appear, so that it would not afterwards be necessary to cut the ligatures and re-open the wound after the sutures had been some hours inserted.

In about half an hour, as there appeared to be no exudation of blood whatever, the flap, after being held up a short time, was brought down and neatly adjusted to the lower border of the incision and fastened accurately in its proper position, especially below the vermilion border of the lip, by a sufficient number (in all some 6 or 8) points of interrupted suture. When the whole was properly placed in coaptation, the general contour of the face seemed now so natural in size and form, and the line of the wound was so little visible, that one could scarcely realize that there existed so much havoc and destruction of parts beneath.

The incision upon the carotid was also brought together, in the same manner by two or three sutures, and the patient let to remain on the table upon which he had been bolstered up, and where he had been

operated upon. Being now, as was to be expected, somewhat pallid and languid, and the pulse greatly reduced in frequency and force, though there was no actual syncope, this was met by a more liberal use of warm wine and water. But he exhibited constantly the same imperturbable calm and resolution which he had during the operation; because he believed, as he said before the operator began, and when he took leave of some of his young friends the day before, upon a higher power than man. It was this serene christian faith and resignation which was the true secret of his incomparable and heroic courage. I have seen such demonstrations, but none of so high an order, on the dying couch, from the same blessed consolation, which none but those who have imparted to them this priceless boon, and through divine grace, can realize or enjoy. And I have often said, that if any thing were wanting to convince me of the power of religion on the heart, and of the constant supervision of the divine Creator over human actions, and the link between Him and the immortality of the soul, it would be these sublime moral spectacles in the hour of overwhelming tribulation and unutterable anguish, and when reliance, and hope alone in our Almighty Father, can disarm death and every mortal sorrow of their sting, and make us triumph over every worldly desire and the grave itself. This patient recovered perfectly in a few weeks, nearly the whole wound having healed by the first intention. T.]

*Case of Exsection of part of the Lower Jaw for Osteo-Sarcoma, at Newark, New-Jersey.* By Dr. Mott, Thursday, Dec. 26, 1844. (Drawn up by P. S. Townsend, M. D.)

The patient H—, was aged about 35. This was a genuine case of the malignant disease known as osteo-sarcoma, but confined almost exclusively to the *alveolar* processes on the left side of the lower jaw, which was the part exsected.

The patient was of rather tall, slender make, pale and thin—with dark hair—and of nervo-bilious temperament. About two years or eighteen months before, during a quarrel, he had received a severe blow directly on this part of his jaw, from a man who knocked him down. About a year ago, the gums over this portion outside began to show a spongy livid appearance from the alveolar process, and its periosteum beneath having become previously inflamed and swollen. The tumor pushed the cheek out in this part, and its size was that of a pigeon's egg. The *warty bed of long fungoid shoots, or vegetations*, on the side of the gum in front, had a very peculiar appearance, being generally about a third to a half an inch in length, and in some places loose with fissures, separating them down to their roots, allowing of an opportunity when these roots were held apart, to notice the carious fetid portions of the alveoli, which were not yet wholly destroyed. Such however, had been the devastation within a year, that the three or four teeth which corresponded to this part were so loose that they could easily be moved with the finger, and of course as readily taken out. The surgeon, (Drs. Darcey, Pennington, Campfield, &c., of Newark, being also present,) commenced his curvilinear incision at his usual place in front of the meatus auditorius externus, and brought it down outside and under the

angle and base of the jaw close to the latter, till coming to near the symphysis of the chin, he terminated the division below the border of the lower lip. The upper border of the wound, and sufficient of the lower being dissected off to insulate the jaw and its tumor and tissues, and two or three vessels tied in the course of this dissection, the *chain-saw* was passed by a sharp thick probe, first behind the front part of the jaw, and that portion sawed perpendicularly from below upwards—not however, without some difficulty from the saw becoming pinched in the bone. In a few minutes after the same saw was introduced in the same manner, a little behind the angle of the jaw, and that portion sawed obliquely upward and forward—the last cut of the saw reaching up to near the fungoid tumor—but evidently outside of the degenerate structure, as the fresh, wholesome surface of the sawed bone showed.

The *diseased portion* was thus completely isolated and exsected, being about 3 inches in extent along the base of the jaw, and less above. After waiting a while for any bleeding from the small vessels to cease, and tying such of the vessels that required it—the flap was brought down, and the ligatures and straps applied in the usual manner.

The patient showed much moral courage as well as physical force for one so thin, pale, and apparently delicate in frame, as he sat up in a common chair, his head only supported behind, during the whole operation. The hemorrhage for a temperament like this was considerable, but not important, and there was not the least syncope or collapse,—the pulse being almost unchanged by the operation.

*Feb. 26, 1845.*—Having read over on this date the above sketch to Dr. Mott, he said the patient had long since gone home quite recovered.

In alluding to the cauliflower appearance that the soft parts or gum in this patient exhibited, Dr. Mott said that it possessed somewhat more of the fungoid character than most cases of osteo-sarcoma.

#### *Claims of DR. MOTT as the Author and Projector of the Operation of* EXSECTION OF THE LOWER JAW.

We cannot permit ourselves to believe that any surgeon of rank, possessing the high moral character which it is presumable should, or we might say must, necessarily belong to at least the distinguished members of the medical profession, as the guarantee of eminence and respectability, would willingly or wilfully deprive another of the honor that belongs to him.

It is therefore through sheer inadvertence or ignorance, which some might call culpable, of the true facts of the case, that must have permitted a surgical gentleman, while giving a public lecture in the capital of Dublin, at a public medical school, and his subject too, *On the Modern Improvements of Surgery*, (See Lecture on that subject by John Houston, M. D., M. R. I. A., introductory to a course of Lectures on Surgery in the School of Medicine, Park street, Dublin, delivered 4th of November, 1844, and published in the *London Lancet* for December 28th, 1844, p. 393, et seq.,) to promulgate, as it were, ex cathedra, and “by authority,” to the rest of the world, the following sweeping eulogy, without a single word of qualification in behalf of any other individual whatever:—



"The *grand exploit* of amputating the lower jaw, even from its articulations, the boldness of which has been only equalled by its success, has now become a standard operation in surgery. Persons afflicted with the distressing and loathsome disease [showing a drawing of it] for which this operation is undertaken, were formerly allowed to die, without any idea being entertained of the possibility of saving them; but NOW THAT A GREAT MIND, RELYING ON A SOUND KNOWLEDGE OF THE CAPABILITIES OF THE HUMAN FRAME, *has set the example* of extirpating the diseased mass *in toto*, many surgeons have fearlessly followed in the path thus laid open FOR THEM, and have derived honor from the success which crowned the enterprise. The success of this operation—both as regards immunity from danger, rapidity of convalescence, and the useful quality of masticatory apparatus which follows—is almost incredible.

"Mr. Cusack (*i. e.*, of Dublin, has operated twelve times, and here, showing them) [*i. e.*, the audience] are the preparations, casts and drawings of the whole series. Now, in all these cases there has been but one death, and that not as the result of the operation, but from erysipelas."

After giving the case of a recent similar operation by Mr. Cusack, as an illustration, Dr. Houston concludes thus:—

"And shall I not call this a *modern* improvement in surgery, when the GREAT AUTHOR and *champion* of it is seated amongst us in this room." (*Loc. cit.*, p. 394.)

To whomsoever, therefore, the honor of this great triumph belongs, *mutatis mutandis*, the eulogium ought to apply equally well in Dr. Houston's conceptions, who, doubtless, would not desire to diminish one iota of it, because a name by different orthography from that of the justly respected Mr. Cusack, should happen to be found by a species of anaplastic substitution, to dovetail more completely than his with the historic facts in the case.

We say cheerfully with all our heart, *palmas qui meruit ferat!* We will also shut our eyes too against such mis-interpretation as the apparent intentional suppression of all other names connected with this matter than that of Mr. Cusack might naturally suggest, for the author of the lecture is since, we regret to hear, deceased.

*Extract from the Report of a Committee, upon the subject of OSTEO-SARCOMA OF THE LOWER JAW to a Medical Society of New-York, April 1st, 1830; D. L. Rodgers, M. D., Chairman. (See American Journal of the Medical Sciences: Philadelphia, 1830, Vol. VI. p. 533,—534.)*

The committee to whom was referred the subject of "Operation upon the Lower Jaw," for "Osteo-Sarcoma," report, That they have diligently examined the subject submitted to their inquiry, and have found much difficulty in fixing the date of the different operations, and in settling the priority of claims. The operations for removing the lower jaw for osteo-sarcoma has been so frequently performed, and so well established, that it is deemed unnecessary at this time to discuss the propriety or practicability of the operation; we shall therefore confine

our investigations to the subject particularly referred to your committee, viz. "To whom are we indebted for the introduction of this operation." In the examination which your committee have bestowed upon this subject, they have not been able to find in the records of surgery a single case in which a portion of the lower jaw was removed for osteo-sarcoma, or even a proposition to that effect prior to the year 1818. In the *Dict. des Sciences Médicales*, for 1818, the operation for removing the lower jaw for the cure of osteo-sarcoma is seriously proposed, and an allusion is made to several cases which proved fatal, and the casts of which are to be seen in the College of Medicine at Paris. But no intimation is there offered of the operation ever having been performed for the removal of this disease. The credit of first removing the lower jaw has generally been given to M. Dupuytren. It is true this distinguished surgeon removed a portion of the lower jaw for a "Cancerous Affection of the Gums" in 1812. This case was reported by M. Lisfranc to the Faculty of Medicine at Paris in 1813. This report of M. Lisfranc is republished in the *Dict. des Sciences Médicales*, for 1818, t. XXIX., p. 430, who describes the case throughout as a case of cancer, and accurately describes its origin, extent, and connections, under the name of "Carcinome." It is evident from the silence that was observed upon the subject by the French writers, that it was not considered of much importance, as the case was found among the archives of the Faculty of Medicine, and not brought forward until the year 1818. It is mentioned in general among the diseases of the lower jaw, in connection with caries, osteo-sarcoma, &c., and it was at this time, when relating the operation of M. Dupuytren, that a removal of a portion of the lower jaw for osteo-sarcoma was proposed. The operation of M. Dupuytren was for a different disease, and of smaller extent when compared to those performed for osteo-sarcoma. It is evident that this operation of M. Dupuytren cannot give him a prior claim to the removal of the lower jaw for osteo-sarcoma. If the removal of a portion of the bone is to establish the claim, then Dr. Whitridge might with as much propriety claim originality, as he extracted one-half of the inferior maxillary bone for a necrosis; Decker removed two-thirds of the lower jaw, and his patient recovered. (*Medico-Chirurgical Review*, No. 28, p. 532.) These operations were performed anterior to the one performed by M. Dupuytren, and thus far he has no claim to originality, as there exists no greater resemblance between the operations of Decker and Dupuytren, than in the operations of the latter and those of Professor Mott.

Professor Pattison, who witnessed the operation of the French surgeon, makes the following remark:—"Dupuytren, when I was in Paris, removed a considerable portion of the angle of the jaw in a case where a cancerous sore was situated over it. The extent of this operation was however trifling when compared with those executed by Dr. Mott." (Burns' *Anatomy of the Head and Neck*, Pattison's edition, p. 485.)

From the authorities which your committee have had it in their power to consult, they are well satisfied that the operation of M. Dupuytren should not be ranked with those formidable cases reported by Mott, Graefe, and Lallemand. Mr. Burns, in his work on the Anatomy of the Head and Neck, makes no mention of an operation for the removal of the lower jaw for the cure of osteo-sarcoma.

The first account given of this operation was by Professor Mott in 1822, (*New-York Medical and Physical Journal*, Vol. I.) This operation was performed on the 19th November, 1821. The case was a young woman, "aged seventeen years, of a healthy appearance and good constitution." The Professor gives a detailed and interesting account of the disease. From the great extent of the morbid parts, the vascularity of its structure, and the great danger from inflammation to be apprehended he considered it a necessary preparatory operation to cut off the current of blood by securing the carotid artery in a ligature; the healing of the wound, and the rapid recovery of the case, is doubtless much indebted to this preparatory treatment; at all events it was of great advantage in preventing an useless loss of blood—by this means preserving the energies of the system, and favoring the rapid closure of the wound. Your committee are conscious that many surgeons have removed portions of the lower jaw without this precaution, and have had cause to regret their bold exhibition of surgical skill; nor do your committee believe that it is necessary to secure the carotid artery by ligature in every case in which a portion of the lower jaw is removed, as several cases are reported in which the operators omitted it; some of these cases were attended with terrible hemorrhage, while others were too insignificant to afford much blood! As an auxiliary in preventing inflammation, no one can for a moment doubt its influence, who has witnessed the effect of cutting off the circulation from inflamed parts. This was in every respect a successful case, and at this date, (1830,) she [the patient] lives in the enjoyment of good health, which is the strongest testimony that we have to offer in favor of the operation. Professor Mott has performed this operation six times—four of which have been successful.

[In connection with the subject of Dr. Mott's exclusive claims, as the first surgeon who ever exsected the lower jaw for *osteo-sarcoma*, we here subjoin his recent letter to Mr. Liston of London, (See *New York Journal of Medicine*, No. 15, Vol. V., November, 1845, p. 413, 414.)

*Letter from Prof. Mott to Dr. Liston, of London.*

TO ROBERT LISTON, F. R. S., Prof., &c.

My dear Sir,—The great object in all our investigations ought to be truth. In no profession is it more important than in the healing art. Our noble profession, if exercised upon this basis, becomes an ornament and blessing to our race.

From the distinguished position you are in, and the thousands who listen to your admirable lessons, and witness the skilful movements of your knife in surgical operations, your opinion of a point of practice, or the author of an operation, will be powerful and lasting.

You are in common with all men tenacious of your own rights, and I cheerfully believe will magnanimously award what is just and right to others. I appeal to you therefore as a professional friend, to weigh me in the balance of justice, and I shall have great pleasure in awaiting your decision.

I claim for myself and for my country *originality* in the operation of



exsection of the lower jaw at the temporo-maxillary articulation, and in different proportions for osteo-sarcoma. I avow and declare solemnly, that [before my first exsection of the lower jaw for osteo-sarcoma] I never saw, read, or heard of anything of the kind ever having been done in any country. There are surgeons now living in this city who saw my first operation, and all of them will cheerfully testify to the truth of what I assert.

Far be it from me to presume to say that other surgeons may not have thought of the same expedient, and since executed the same operation without the least knowledge of what had been done by me; of one thing, however, I am certain, that an eminent surgeon now in Paris, informed me that he took the printed sheets of my first case with him to Paris and told M. Dupuytren of them; he (Dupuytren) requested a translation to be made, stating, that in a few days he would give a clinique on that subject. The translation was made by my friend and handed to Dupuytren. He gave his lecture with my case in his hand, but made no allusion to it. My firm belief therefore is, that my operation for osteo-sarcoma was performed before those of this eminent surgeon [for that affection.]

Some two or three years after the publication of my first case, I read an account of several cases which were operated upon by my friend Dr. Cusack, of Dublin. Knowing as I do personally that distinguished surgeon, it never occurred to me to say anything in relation to this subject in all our intercourse in Dublin and Paris. From whom he derived the idea, therefore, I know not; it may also have been original with him. This, however, can only be answered by Dr. Cusack himself. As you have stated in your lectures published in the *Lancet*, that Dr. Cusack was the *first* to perform the operation of exsection of the lower jaw for osteo-sarcoma, I have felt constrained to make to you this statement in justice to myself.

My first operation was performed on the 17th November, 1821, and is published at length with plates in the "New York Medical and Physical Journal," vol. I., p. 385.

Since that period I have performed the operation *seventeen times*. In three instances the bone was removed at the temporo-maxillary articulation. In one of the cases, the bone was sawed through at the first bicuspid tooth of the opposite side.\*

All surgeons of reading or observation must be aware that from time immemorial, either large portions or even the totality of the lower jaw have been removed or destroyed by violence, various accidents, and in later times by gun-shot wounds, fire-arms, &c. It has also long been familiarly known that partial or total destruction of the lower jaw has been spontaneously produced by the morbid processes of caries, necrosis, &c. Thus nature herself, in these latter cases particularly, pointing out as it were to the surgeon, from the perfect restoration to health that has succeeded to such disasters, that he himself might venture to follow in her footsteps.

For the great historical details, we refer to Velpeau's *Operative Surgery*, vol. III., Paris edition, 1839.

\* See this case, with plates above, being that of the negro *Prince*.

But lastly, we repeat and aver, that the exsection of the lower jaw of even a fourth part, much less a half or two-thirds of it, for any form of sarcoma involving the whole texture of the bone, has never in our opinion been performed by any surgeon, past or present, until by myself at the time above stated.

The *onus probandi* that my claims are unfounded rests with others. For my part, I know of no record in existence now, nor did I know of any at the time I performed the operation, as I have already said, which can in the slightest degree militate against my pretensions.

Even admitting that M. Dupuytren did exsect a portion of the lower jaw, prior to myself, it is conceded by Velpeau, who pronounces his operation altogether *new*, and a *great triumph* in surgery, that it was performed for cancer and not for osteo-sarcoma.

Indeed we find that so eminent an authority as M. Ribes (*Dict. des Sciences Médicales*, tome XXIX., page 431, Paris edition) also positively asserts upon the testimony of M. Lisfranc, who assisted at and published an account of the above operation of M. Dupuytren in 1812, that it was a *cancerous degeneration*; and shows furthermore that M. Ribes himself so considered it, he, in his preliminary observations on the lower jaw in the same work, speaks in the following *prophetic* language, in reference to the pleasing anticipation that this exsection for cancer would ultimately pave the way for a similar operation for the cure of that hitherto intractable and fatal malady, osteo-sarcoma. His words are as follows: "These facts lead to the hope that fungus, or *osteo-sarcoma* of the lower jaw, a disease so formidable, that it has in many cases been vainly attacked with the iron and fire, will *henceforward since the operation performed by M. Dupuytren be removed by amputation* of a portion *more or less considerable of the lower jaw*, without the danger of any accident, and *if the disease is local, with a certainty of success.*"

We are also aware that M. Bégin's (*Dict. de Méd. et de Chir. Pratique*, Paris, 1835, Vol. XIV., p. 259) states that Dr. Fischer appears to be one among the first who has performed the exsection of the inferior maxillary bone at the temporo-maxillary articulation. His operation dates in the year 1795, and furthermore, M. Bégin remarks (*Ibid.*) that he has been successively imitated by Mursinna, Graefe, Mott, Dzondi, McClellan, Liston, Jæger, Dupuytren, Walther de Bonn, and MM. Gensoul and Lisfranc.

So far as *the disarticulation* of this bone is concerned, M. Velpeau (the most accurate living authority in relation to the history of surgery) distinctly asserts that M. Palmi was the first individual who first disarticulated the lower jaw.\*

For ourselves we can assert, that without attempting to *imitate* any of our predecessors, the disarticulation of the lower jaw, where we have resorted to this, has been performed by us purely in reference to the exigencies of the case and presented while exsecting this bone for

\* Dr. W. H. Deadrich, of Athens, Tennessee, published in the sixth volume of the "American Medical Recorder" for 1823, an account of an operation by which he removed the lower jaw from the angle to the centre of the chin, for a large cartilaginous tumor, which occasioned great difficulty in swallowing and breathing. The patient was a lad fourteen years old, and the operation was performed in 1810. This boy had a speedy recovery. This was made public two years after the publication of my first operation.—V. M.

osteo-sarcoma, and that we claim priority and originality both for the exsection for osteo-sarcoma, as well as for the single curvilinear incision below the base of the jaw, by which the operation is accomplished.

With considerations of the highest respect,

Believe me to be, truly your friend,

VALENTINE MOTT.

NEW YORK, Sept. 30, 1845.

Another case of *exsection* by Dr. Mott, viz., that of the ends of an ununited fracture of the *os brachii*, will be found above, under the head of *Ununited Fractures*—*Exsections*.

To these are to be added for years past various other *exsections*, almost invariably with a happy issue, of portions both of the *upper and lower jaws*, their *dental borders*, &c., &c., which he has not deemed of sufficient importance to publish the details of. T.]

[We subjoin the following from among the cases in which we have *exsected* the lower jaw. We have found but one example recorded analogous to Case 1st, and in that the jaw was removed by Mr. Anthony White, of Westminster Hospital, London, and is reported by Mr. South in the 3d volume of his edition of *Chelius*. Cases III. and IV., are interesting from the fact, that extensive plastic operations were likewise required, as well as from other practical bearings.

*Case I.*—*CARIES*.—Peter H. Fowler, of Montgomery Orange Co., N. Y., came under my care in February, 1848. From the history of the case I learned that, in the latter part of December, 1847, Mr. F. had experienced considerable uneasiness about the left angle of the jaw, which he attributed to the irritation excited by the fangs of a decayed molar (last) tooth, and which were removed by his attending physician, Dr. Evans, of Walden. This proceeding, however, afforded no permanent relief; his face began to swell, his breath to become offensive, and in a short time several openings communicated externally with the bone. At the time of my first visit, Feb. 19th, the lower part of the left side of the face was greatly swollen, and presented a fungoid appearance. On making free incision into the swelling, exit was given to a considerable quantity of matter, resembling that which usually is found in the vicinity of a diseased bone. A probe, passed through the openings, at once struck upon the denuded bone, which was evidently in a carious condition. The patient thought he could distinctly feel a loose portion of bone, but in this he was mistaken. A careful examination led us to conclude that the bone must be in a carious condition, from near the symphysis to the angle of the jaw, and to propose its removal. Feb. 26th, with the assistance of Drs. Evans, Crawford and Eager of Montgomery, and Phinney of Newburgh, I proceeded to operate. During the week which had passed since my last visit, the patient's condition had become much worse, for he was now strongly threatened with suffocation from the quantity of matter which ran down his throat, whenever he attempted to sleep. This, together with the cough which was excited by the same cause, rapidly exhausted his strength, and gave a serious aspect to his case. Supposing the disease to be limited to the points above specified, my first incision was made through the enor



mously swollen cheek, from the angle of the jaw, in a horizontal line, to a point about three quarters of an inch below the commissure of the lip. The knife was passed directly down to the bone, and the latter cleared as rapidly as possible from the soft parts by which it was surrounded. The hemorrhage from the facial vessels was small, and no ligature was necessary. On reaching the inner angle of the jaw, we found a large pouch of most offensive matter, which had burrowed between the pterygoid muscles and the bone, and which so encroached upon the pharynx as to add to the danger of the impending suffocation. This was scooped out, and our exploration continued along the inner side of the ramus, which was found to be in such a ragged condition, as to leave no doubt in the minds of all present as to the propriety of its removal. Another incision was, therefore, made from the zygomatic process along the posterior margin of the ramus, till it met the outer border of that which had been made along the base of the jaw. Considerable difficulty was experienced in our attempts to disarticulate the bone, as the condyloid process was immovably bound to the glenoid cavity by a deposit of bone. This was finally ruptured, and the operation completed. The only hemorrhage with which we had to contend in the latter part of our proceedings was occasioned by a plunge of the patient, which nearly upset me, and caused me to divide, either the main trunk or one of the largest branches of the internal maxillary artery. Owing to the retraction of the vessel, it was found impossible to apply a ligature; but the bleeding was easily restrained by pressing a piece of sponge into the wound. On account of the absolute impossibility of ascertaining the boundaries of the disease before we commenced, the operation was necessarily protracted, and, we need not add, severe. Our patient was, of course, greatly prostrated; not, however, by hemorrhage, for that was but trifling,—but from the shock which so formidable a proceeding must almost invariably produce. For some months after the operation he continued to improve in strength. The symptoms of impending suffocation, and the cough which had previously harassed him, immediately disappeared. The tumefaction of the face, however, not only continued, but, in a few weeks, began to increase. Abscesses still formed occasionally around the eye and temple, which were opened, when they discharged a large quantity of matter. Indeed, the whole progress of the case up to the present time (March 15th, 1852) has been so peculiar, that we are tempted to insert in this place the following extract from a letter of Dr. Evans, his attending physician, dated Sept. 2, 1850.

“The operation was performed Feb. 26th, 1848. The wound never healed; fungus granulations filled it, and the adjacent parts seemed to degenerate into a similar fungoid condition. This gradually extended over the neck, and now, two and a half years since the operation, it reaches within an inch of the clavicle. The glands on the other side of the neck are enlarged and very hard. Their size varies considerably at different times. The skin over the neck is hard and unyielding, which causes his head to be constantly bent forwards. This indurated condition of the parts about the trachea, by the stricture which it produces, seriously affects his respiration. For the last eight months he has been obliged to sleep in a chair, in the erect position. Fungus growths sprouted from the different points where the abscesses had

been opened. His present condition, compared with that which he presented one year ago, is as follows: the abscesses on his temple and in the vicinity of his eye, are slowly improving. The fungus on the lower part of his face and neck, extends over a larger surface, and continues gradually to spread. The glands on the other side of his neck, one-half larger. His general health rather better, which he attributes to the use of Lugol's solution of Iodine, which he commenced taking last spring. A few days since I put him on Iodide of Iron. I think his lungs still retain their integrity. Every winter he runs down, and comes out quite feeble in the spring. During the summer he again recruits. In the winter he is troubled with indigestion, when his respiration is always worse, the agony sometimes being intense. You recollect that Prof. — and Dr. — considered his disease *cancer*. Time has shown that they were mistaken. Pus always has, and still does form in abscesses. It is never thin and ichorous, but always of a good character. From the present condition of his throat, and the effects of winter upon him, I doubt whether he can survive another spring." This patient is now, April 1855, in perfect health.

*Case II.—Osteo-Sarcoma.*—On the 25th of March, 1848, I removed the left half of the lower jaw, from the chin to the articulation. The patient, aged 14, a son of Mr. J. P. Cole, of Wantage, Sussex Co., N. J., was affected with osteo-sarcoma. The tumor, of three years growth, commenced near the left angle of the jaw, and at the time of my visit, had attained the size of a goose egg. It gave rise to no pain, but its growth was rapid, having in six months before the operation increased more than in the previous two and a half years. With the assistance of Dr. Cooper, and several physicians from the adjoining towns, I proceeded to operate. An incision was commenced beneath the zygoma, and was carried along near the posterior border of the ramus and inferior edge of the base of the jaw, to a point below the chin. The hemorrhage from the facial veins was considerable; but with that from the facial artery soon subsided. No ligature to this artery was required. Only one vessel, a branch from the internal maxillary, was tied. The bone was divided by a saw at the symphysis, and the dissection carried to the articulation. Though the patient had been insensible to pain, from the use of chloroform, yet when the operation, which lasted about 25 minutes was completed, he appeared to be greatly prostrated. He soon rallied, however, when the wound was lightly dressed, and with the exception of a slight erysipelatous attack of the wound, his recovery was rapid. I saw the patient two and half years after the operation, when he was working in the hay field, in perfect health. The trifling deformity remaining was indeed surprising. A firm fibro-cartilaginous band supplied the place of the removed bone, and his power of mastication was most excellent. Four years have now passed since the operation, and as we have recently been informed, his health is in every respect perfect. The tumor, which involved nearly the whole body of the ramus, is now in the Museum of the College of Physicians and Surgeons, N. Y., and has been pronounced by able pathologists to be a beautiful specimen of osteo-sarcoma.

*Case. III.—CARCINOMA.*—Mr. Nolty, of Newburgh, about 45 years of age. Had submitted two or three times to the excision of a small

portion of the lip and bone, affected with carcinoma, before he came under my care. In every instance, shortly after the healing of the wound, the disease had returned. At the patient's urgent request, and against my own judgment, on the 30th August, 1848, I removed the entire lower lip, together with a portion of the symphysis. A new lip was formed by cutting through the cheeks on each side from the commissure of the mouth. These incisions extended through the whole substance of the cheek, except the lining membrane, and extended about an inch and a half on each side. The portion of the cheeks divided, immediately retracted, leaving sufficient of the lining membrane to form the vermilion border. This membrane was divided close to the level of the inferior margin of the upper part of the wound, and reflected over the borders of the upper part of the lower edge. Then the cheeks were detached from the bone towards the angles of the jaw, and drawn together in the median line. The patient was seen some months afterwards by one of the most eminent surgeons in N. Y., who pronounced it the best specimen of cheiloplasty that he had ever seen. Some time after this, the disease again appeared. He submitted to another still more extensive operation by another surgeon, and after lingering in a miserable condition for nearly a year, died.

Prof. Gross, in his very able Report on the results of surgical operations in malignant diseases, *Trans. Amer. Med. Assoc.* Vol. VI. p. 181, remarks, that the above is one of the most remarkable cases on record showing that life may be prolonged in these instances by repeated operations, no less than five having been performed on this patient between 1844, and 1851, the date of his death.

*Case III.—OSTEO-SARCOMA.*—Miss Fowler, aged 18, of Milton, Ulster Co., N. Y., first perceived an enlargement on the right side of the symphysis some few months before I saw her in the spring of 1850. Its growth was rapid; but she suffered no pain. At the time of the operation (in March, 1850,) the tumor involved the parts from the first molar on the right to the bicuspid on the left side. An incision was made across the under surface of the base of the lower jaw; the soft parts were then reflected, and the bone was divided through sound portions of the bone. In this case, I had a large needle, armed with a strong cord, ready to use in case of retraction of the tongue, but from what occurred when the tongue was severed from the bone, (the patient being nearly suffocated,) I shall never again remove the whole of the symphysis without having properly secured the tongue. Chloroform worked admirably in this case. For some 12 hours after the operation, I thought I should lose my patient from hemorrhage; not from any particular artery, but but from a general oozing from all the divided parts. This, however, was finally checked, and the patient in a few days left Newburgh (where the operation was performed) with the wound healed. Four weeks after the operation I had the pleasure of dining with her, and was surprised to see her powers of speech and mastication, which, of course, were at first, entirely destroyed. For a few days, indeed, she took her food through a large gum elastic tube passed into the throat. This patient is now, we believe, in perfect health, and scarcely any deformity has resulted from the operation. In this case I was ably assisted by



my friends, Drs. Gardner, Drake and others, of Newburgh, and Dr. James L. Van Ingen, of Schenectady.

*Case IV.*—CARCINOMA.—Peter Space of Sussex Co., N. J., consulted me in the early part of August, 1850. For two or three years he had suffered from a carcinomatous affection of the lower lip, which, although once excised, had now involved in one mass of destruction, not only the soft parts covering the bone, but the bone itself from the second molar tooth on the right side to the first molar on the left. His condition was truly deplorable. His sufferings were great, not only from the pain with which he was harassed, but from the offensive discharge which ran down his throat whenever he attempted to sleep. The odor, too, which he was obliged constantly to inhale, was most disgusting. The glands of the neck were free from disease, his pulse was about 80, and there was every reason to believe from his appearance, that, contrary to his wishes, his life might be prolonged for several months. He was candidly told that all he could expect from any operation, would be the removal of the huge mass of disease from the situation it then occupied, to one which would perhaps be more tolerable, a cure being entirely out of the question. He was anxious for the operation, and on the 12th of August, assisted by Dr. Alexander Linn, of Dickertown, Dr. Winfield, of Middletown, and Dr. Cooper, of Wantage, I removed the affected parts. The patient, without my knowledge, had during the day taken large doses of opium to blunt his sensibility to pain during the operation, and whether it was owing to this cause or some other, I know not, but chloroform served only to render him boisterous, and we were obliged to discontinue its use. Though I had taken the precaution to pass a strong cord through the tongue, and had intrusted this to an assistant, still the moment it was separated from its attachments to the bone, its retraction was so violent, that in the act of suffocation, he fell backwards to the floor, carrying with him some two of the assistants who were supporting his head. I immediately seized his head with my left hand, and pressed it forwards and downwards, while with my right, I grasped the cord, and pulled the tongue out of his mouth. At this stage of the operation, matters presented truly a frightful appearance, and for a few moments I was very apprehensive of a fatal termination. The tongue having been properly secured, the patient again rallied, when I endeavored, by detaching the skin from the neck to cover by a plastic operation the huge cavity I had formed. To effect this, however, I was obliged to loosen also that covering both upper jaw bones, which was drawn downwards to meet that taken from the neck. In this manner I succeeded beyond my own expectations in accomplishing the object intended. After securing the tongue and dressing the wound, I left the miserable patient in the care of Dr. Linn, who, with Dr. Cooper, kindly attended to the subsequent treatment of the case. On the 25th August, 13 days after the operation, Dr. Linn thus wrote me a letter, from which the following is an extract :

“ I am happy to be able to inform you, that our patient, Space, is doing well. When I visited him the next day, (after the operation,) I perceived the integuments on the right side of the face were somewhat discolored, and in a few days a considerable portion of them sloughed out, leaving the mouth of very uncouth dimensions. In all other re-

spects the case is doing well, union by the first intention having taken place throughout. His general health is good, and the deformity of the face, though great, far less disgusting than previous to the operation."

On the 28th of January, 1851, some five and a half months after the operation, Dr. Linn wrote me again, as follows:

"I am sorry to inform you that your patient, Space, is in a most deplorable condition. A few weeks after I had discontinued my visits, (his face having nicely healed, and there being no appearance of a return of the disease, when I dismissed him, cured,) I found ulceration had commenced in the mesial line, below the tongue, involving the glands in the vicinity. The whole of the anterior part of the neck, from the tongue to the top of the sternum, is one diseased mass, covered by a most foul stinking ulcer. A number of the glands in the vicinity have suppurated, and then healed. There are many enlarged glands about the thorax. His general health is failing, and altogether he is the most pitiable object imaginable."

He died in less than a year after the operation.—Was the operation justifiable in this case, *on the grounds for which it was undertaken*? If not, did the success obtained in Dupuytren's first case, (Lesier,) in 1812, offer any encouragement to my patient? Let those who are disposed to condemn my operation carefully peruse that to which we have alluded, and in which the celebrated French surgeon is said to have operated for *Carcinoma*. G. C. B.]

#### ARTICLE VI.—UPPER JAW.

Encouraged by his first successes, and by the instances of destruction of the sinus and certain serious lesions of the upper maxillary bone, which had cured spontaneously, Dupuytren soon conceived that the upper jaw also might be exsected. It appears likewise that Acoluthus (*Mem. de l'Acad. Royale de Chir.*, t. V., 1819, had already performed this operation, in 1693, for a tumor of the face, and that his patient had recovered. Camper also speaks of a patient in whom the upper maxillary bone came away entire, and who, however, survived. Ruysch, (*Obs. Anat. et Chir.*, Obs. 48, p. 67, in French,) in extirpating a fungous excrescence from the palate, removed, at the same time, the carious bone which gave origin to it, and cauterized the bottom of the wound. In a case of sarcoma, of the size of two fists, mentioned by Planque, (*Bibliot. de Méd.*, t. XXIII., p. 70, in 12mo,) the cheek was divided in order to excise the tumor, and two or three teeth and a portion of the corresponding bone removed with it. The patient recovered. The partial exsection of the upper jaw, in a case of fungus of the sinus, had also been performed by David, (*Sprengel*, t. VIII., p. 281,) and by Beaupreau, (*Acad. de Chir.*, in 12mo., t. XII., p. 56,) who, however, removed only the alveolar border. Siebold (*Annales de Méd. d'Altembourg*, Février, 1808) also relates one of the most remarkable cases of this kind. The tumor, which occupied the left maxillary fossa, had, in the space of twelve years, acquired such volume and assumed an aspect so revolting, that the magistrates had the patient confined to his own apartments. In 1800 this tumor extended from the right canine tooth to the left molar, occupying the whole of that portion of the alveolar

border, and made a very considerable protrusion externally. After having separated it from the upper lip, its exsection was made with the saw, and the tumor extirpated entire. The pain and hemorrhage were much less than had been apprehended; the maxillary sinus, which was divided into two cavities, having been laid open, was cauterized with hot iron, and in six weeks the patient left the hospital perfectly cured. Bidloo and Desault, however, who had also both conceived the possibility of this operation, and which moreover had been performed by Deschamps in 1804, and by Klein in 1805, (Jæger, *Op. cit.*, p. 12,) confined themselves to recommending it without, however, ever having, as it appears, performed it.

### § I.—Indications.

These ideas though vague and imperfectly defined, take away however, as we perceive, all the merit of invention from the moderns on the subject which we have under consideration; and which subject moreover is, in reality divided into two parts, that of the exsection and that of the disarticulation of the bone.

M. Pillard, (*Lancette Française*, t. II., p. 264; *Clin. des Hôpitaux*, t. III., p. 81,) asserts, and the bulletins of the faculty establish the fact that Dupuytren, (*Bulletin de la Fac. de Méd.*, t. VII., p. 21,) had recourse to the first of these operations in 1819 and to the second in 1824. M. Pillet, (*Lancette Française*, t. II., p. 284,) who maintains that up to that time M. Gensoul alone had performed this last operation, asserts that the patient of Dupuytren died at the Salpêtrière, and that a portion of the jaw had been left behind. It was in the year 1826, that M. Lizars who also claims priority in this operation, first proposed it, and afterwards in 1827, 1828 and 1830, performed it with success. But as it appears to me, too much importance has been given by all parties to this dispute. From all times past, there have been performed exsections of some portions of the upper jaw; in our times we have gone farther; more at least, and that comprehends the whole question. Though this bone should have been removed in its totality, which is not easy to prove, even that would not merit the title of an invention. This discussion therefore does not deserve any farther attention to be given to it. The merit of M. Gensoul consists in having devised a process by which we are enabled according to fixed and precise rules, to disarticulate the jaw, instead of excising or amputating it in the manner this operation has been performed by Dupuytren, MM. Wattman three times in 1820; Graefe three times in 1823, Textor, Robinson, Jæger, Chelius, (Jæger, *Op. cit.*, p. 12—13,) and Liston and all the other surgeons of whom I am about to speak.

[As Prof. Syme still claims priority in this operation, we have thought proper, notwithstanding our author's dismissal of the question, to present the following facts:

Dr. Jameson of Baltimore, on the 11th of November, 1820, removed an enormous fungoid tumor involving nearly the entire body of the maxillary bone. The carotid was tied as a preliminary measure. Full details of this case are given in the *American Medical Recorder*, Vol. IV., 1821, p. 222. Accompanying the report, is a graphic illustration



of the appearance of the patient before the operation. Three months afterwards, he was in perfect health. In August, 1823, Dr. Alexander W. Stevens, of this city, removed a large portion of the upper jaw for a disease of the antrum, and seven years afterwards his patient was in perfect health. (Velpeau's *Surgical Anatomy* with an Appendix, by John W. Sterling, Vol. II. p. 518, N. Y. 1830.) Dr. Stevens claims, and we believe justly, that he was the first to operate upon the now established principle, of cutting through the *sound* and not the diseased parts.

Dr. David L. Rodgers, of N. Y., in May, 1824, successfully removed the greater portion of the upper-jaw affected with osteo-sarcoma (*N. Y. Med. & Phys. Journal*, Vol. 3d.) Mr. Lizars of Edinburgh, in 1826, proposed the *entire* removal of the upper-jaw, and described at length the plan adapted to this purpose. (A System of Anatomical Plates, &c. Part XX., 1826.) In December 1827, he attempted to carry this plan into execution, for the removal of a medullary sarcomatous tumor of the antrum, but was obliged to desist on account of the hemorrhage. On the 26th of May, 1827, Gensoul, of Lyons removed the entire superior maxillary bone, with the whole of the palate bone. His patient recovered. (*Lettres Chirurgicales sur quelques Maladies graves du Sinus Maxillaire, &c.*, p. 18.) On the 1st of August, 1829, Mr. Lizars performed his second operation which was completely successful, and yet, in the face of these facts, and those recorded by our author, we find Mr. Syme in 1848 using the following language: "In that year, (1829,) I proved, by the operation, the practicability of removing the upper-jaw, and established a plan of proceeding, which, without any alteration except as to the subordinate details, has since been adopted by the profession!" G. C. B.]

## § II.—Operative Process.

In certain cases Dupuytren confined himself to exsection of the alveolar border only, by means of the cutting pliers, or the gouge and mallet; in other cases he has found it advisable to execute certain incisions upon the face, in order to effect the more complete removal of the osteo-sarcom, and many of his patients who were thus treated were well cured. One of those of M. Gensoul was perfectly re-established. M. Syme, (*Lancet*, 1829, t. II., p. 677,) who made trial of this operation in the beginning of the year 1829, for a cancerous tumor of very considerable volume, thought it advisable to make a crucial incision, one of the branches of which terminated at the corresponding commissure of the lips, then to dissect off, and turn back the four flaps, and to exsect the tumor by means of a saw and chisel, and a very strong scalpel. At the expiration of some months, vegetations of a doubtful character led to the apprehension of a return of the primitive disease.

The three successful cases of M. Lizars, in two of which he previously tied the carotid, having been obtained in discases, and by processes of various kinds, cannot serve as a basis for the operative manual. The cure of his two first cases also, was only temporary. In disarticulating the upper jaw, M. Robert, (*Gaz. des Hôp.*, 1834,) followed very nearly the process of M. Gensoul; while M. Sanson, (*Rev.*

*Méd.*, 1834, p. 313,) confined himself to excision. M. V. Mott having performed this operation fourteen times, must also have been obliged to employ various processes.

A. M. Gensoul asserts (*Lettre Chir.*, etc., p. 12—49, 1833,) that he has removed the maxillary, malar and palatine bones: that he has eight times extracted and several times excised the first of these bones; that in one case he removed the pterygoid process itself down to its base; that six of his patients recovered, and that in two others the cancer returned. This is his process: A quadrangular flap raised up on the orbit and forehead; four strokes upon the chisel, one on the summit of the external orbital process, one on the zygomatic arch, one on the os unguis, and ascending process, and the fourth on the middle of the jaw below and under the nose, to detach or to disarticulate the bone, after which some cuts with the bistoury to complete the division of the soft parts, constitute the whole operation.

B. M. Lisfrane laid bare the facial tumor with a V incision, cut through the naso-palatine septum with M. Colombat's pliers, and terminated the operation with the gouge and mallet. In 1823, M. A. H. Stevens, [of New-York,] for a similar case made use of a flexible saw which he inserted through the bone by means of a puncture; while in 1824, M. Rogers, [Dr. David L. Rogers, of New-York,] who removed the jaw on both sides down to the pterygoid processes, scarcely found it necessary to divide the lip. To the cases of this operation already known, it is necessary to add the one which M. Piédagnel, (*Bull. de Fer.*, t. XV., p. 294,) observed in 1818, in the service of Beauchêne, that which M. Lafont, (*Arch. Gén. de Méd.*, t. XXVII., p. 264,) communicated to the Academy, the successful case of M. Syme, (*Edinb. & Surgical Jour.*, t. CXXXVII., p. 382,) and that of M. Georgi, (*Bull. de Fer.*, t. X., p. 83.) M. Guthrie, (*Encyclogr. Méd.*, 1836, p. 42—44,) who has performed it three times was obliged in one of his patients to take away at the same time the malar bone, os unguis and inferior turbinated bone. M. Warren has also perfectly succeeded in his cases. Though M. Regnoli, (*Compte-rendu de la Clin.*, etc., 1837,) removed only the alveolar border, and M. Serre, (*Encyclogr. Méd.*, 1836, p. 104,) confined himself to the excision of the wall of the sinus maxillare, M. Stilling, (*Journ. des Progrès*, t. X., p. 239,) is of opinion that he removed the whole bone. M. Krimer, (*Ibid.*, t. II., p. 5; t. III., p. 239; *Bull. de Fer.*, t. XX., p. 217,) and M. Samel have noticed something still more interesting: in their patients the teeth have been reproduced!

C. *The Author.*—I also have had occasion to perform excision of the upper jaw in a woman aged forty-five years. All the molar teeth of the left side had been extracted or destroyed. An opening capable of admitting the extremity of the finger, allowed of an easy exploration of the interior of the maxillary sinus, which was covered with bleeding vegetations. The borders of this sinus also in a fungous state were hard and lardaceous, and blended with the surrounding tissues. Many portions of necrosed bone connected with its outer and anterior walls were noticed in the midst of the degeneration, which extended back to the velum of the palate, in front to the incisor teeth, and in-

wards to near the median line. The operation was performed in the fore part of July, 1829, at the Hospital of Saint Antoine.

*First Stage.*—An incision commenced at the commissure of the lips and carried obliquely upwards, outwards and backwards, as far as the temporal fossa, between the external orbital angle and the external ear, enabled me to avoid with certainty the duct of the parotid gland, and to raise up in front, after having dissected it, a triangular flap comprising all the soft parts which cover the malar bone and the canine fossa.

*Second Stage.*—With one stroke of the saw applied immediately under the orbit, I divided the projecting portion of the zygoma, and penetrated into the sinus; by means of a very strong scalpel, shaped like a pruning-knife, I divided, after having extracted one of the incisor teeth, the jaw in front, so as to unite the second section with the first; by a third cut I prolonged the incision from the hard parts to the molar tuberosity. By this means I cut round all the lardaceous tissues, a great portion of the necrosed bones, and the totality of the facial walls of the sinus. With the point of the same instrument introduced into the interior of the mouth, I divided the horizontal portion of the vault of the palate in a direction parallel with the median line. I then returned to scrape the floor of the orbit, and made use of the dissecting forceps to extract several lamellæ which remained behind, and which belonged to the palatine bone, the posterior wall of the sinus, or to the orbital cavity itself. In one part, I was obliged to penetrate to the zygomatic fossa, and in another, into the interior of the orbit. I could then satisfy myself that the bones which divide this last cavity from the antrum highmorianum had been destroyed, for the finger, carried to the bottom of the wound, raised the globe of the eye forwards, and reversed it under the upper eyelid.

*Third Stage.*—Under the fear that some fungosities or fragments of diseased bone might have escaped my researches, I applied the red-hot iron over the whole extent of this large excavation. After having filled the wound with small balls of lint, I united the two lips by means of four needles and the twisted suture, and supported the whole by a simple containing bandage. The general and local symptoms, which were quite serious for two days, soon subsided. On the fifth day the whole wound was cleansed, and I removed the two last points of suture. At the end of eight days the suppuration had ceased to become foetid. When I quitted the service of the hospital three weeks after, the interior of the mouth was of a healthy color, scarcely sensitive, and in progress of cicatrization. I learned that this woman returned home before being completely cured, and that, in some months after, her primitive disease returned. In a patient whom I operated upon in the same hospital in 1830, and in whom nothing more was required than the excision of the left alveolar border, the cure was completed on the twelfth day, and the patient has remained perfectly well ever since.

III. If, however, the disease should seem to require that the whole bone should be removed in the manner of a tumor, the process of M. Gensoul would offer real advantages, not in respect to the form of the flap, but as to the mode by which the jaw is to be extracted. In other respects, whether we use the chisel, saw, rowels, modern osteotomes or the trephine, the incision of the soft parts, such as I have described it



farther back, slightly modified if the state of the tumor should make it necessary, will most usually be found to answer; it is difficult, as it seems to me, to imagine one more simple and easy. The crucial incision employed by M. Syme, incurs too great a risk of wounding the duct of Stenon, and does not offer any greater certainty of laying bare the parts that we wish to remove. The employment of a small sickle-scalpel (vid. supra) was also found by me to be exceedingly useful, and seems calculated to give great assistance under such circumstances. If the alveolar border only should be affected, we should be enabled also, by means of the cutting pliers, to remove the whole disease without making any incision into the lips. In the contrary case, should it become necessary, we ought to divide the tissues on each side, following the oblique line, which I have described above. This operation, moreover, is one of those in which the manual must, in a measure, be regulated by each particular case, and one in which we should guard ourselves against being restricted by any rules that are too rigorous.

The extraction of a simple sequestrum comprising the greater part of the bone, an example of which occurred in the service of M. Roux, in 1829, does not, either in the upper or lower jaw, leave near as great a deformity as the operation of exsection. A new production almost always ultimately succeeds to the ancient one and it would be in such cases, only that we might, *perhaps*, with MM. Krimmer and Samel or Samuel, admit the possibility of the reproduction of some of the teeth.

[Numerous cases of the exsection of the upper jaw have been reported both in the American and European journals, but as there are doubtless many unsuccessful cases which have not been placed on record, it must be a matter of great difficulty to arrive at any thing like an accurate conclusion as to the mortality following this operation. Mr. Henry Smith in his work on Operative Surgery, estimates this mortality at about one in four cases, and as to the ultimate effects, it is stated by Prof. Gross in his very able Report *On the Results of Surgical Operations in Malignant Diseases* (Trans. Amer. Med. Association, Vol. VI., p. 289,) that of eleven cases operated on by Lizars, Syme, Robert, Scott, Earle, Guthrie and Hetling, only one was completely successful. Mr. Liston condemned any operative interference in encephaloid disease, undoubtedly one of the most common forms of the affections involving the superior maxillary bone, and it is reported, that of seven operations performed by this distinguished surgeon, in only one instance did the malady return, and prove fatal. Mr. O'Shaughnessy states that between 1827, and 1836, this operation was performed fifteen times, and out of the fifteen there were eleven deaths. This want of success Mr. Liston attributes to the "foolhardiness" of the operators in attempting to cure what he regards as an incurable malady. Of seven cases of excision of the upper jaw by Prof. Gross, four terminated fatally; two from a recurrence of the disease, one from pneumonia, and one from dysentery, in one there is a relapse, whilst two appear to have entirely recovered. One of these two cases was non-malignant, while the tumor in the other possessed all the physical properties of encephaloid (*Op. cit.* p. 190). In view of the discouraging results following the exsection of the upper jaw for encephaloid disease, a different operation has been tried both by Dr. Mott and myself. Both primitive carotid arteries

were tied for the purpose of arresting the progress of the disease and prolonging the lives of the patients, and the effect has been most gratifying. Nearly seven years have elapsed since we performed this operation on a lad 13 years of age, affected with a disease of the antrum, of the malignant nature of which Dr. Mott who saw the patient, had no doubt. There was an interval of three weeks between the operations, and the morbid growth, which distended the cheek, and protruded from the nose and mouth, at once became shrivelled, and soon disappeared. The young man is now in perfect health, and engaged as a clerk in a hardware store in this city. Within the last year he has been exhibited by Profs. Mott and Parker, to their classes in the University College, and the College of Physicians and Surgeons. Prof. Syme has proscribed the operation of exsecting tumors of the upper jaw in the following cases, viz: 1st, those that grow from the gum, or alveolar region, and have not extended their roots beyond these limits; 2d, those of a malignant kind, which originate from or extend to the base of the cranium; 3, cysts, containing serous fluid, developed within the substance of the bone, and existing either independently or in connexion with teeth remaining latent in the jaw; 4, abscesses of the maxillary antrum. An enlargement at the root of the nose; an obstruction of the nostril on the affected side, especially if it has appeared at an early stage of the disease, and is attended with the appearance of a polypus in the cavity; or displacement of the eye-ball outwards or forwards, he regards as an insuperable objection to the operation. (*Contributions to the Pathol. and Practice of Surgery*, p. 254). G. C. B.]

#### [EXSECTION OF THE UPPER JAW.]

In February, 1843, (Cormack's *London and Edinburgh Monthly Journal*, &c., June, 1843, p. 495, &c.,) Mr. Syme of Edinburgh, states that he removed, in a man aged 26, a singular tumor of five months' growth, which occupied nearly the whole left side of the upper jaw up to the orbit, involving also the antrum which was found on its anterior wall, to have been reduced to a shell of bone from pressure of pendulous bodies of an epulotic character growing within it, and similar in consistence with like vegetations upon the gum and palate. A curvilinear incision, with convexity downwards, was made through the cheek, from the prominence of the cheek to the angle of the mouth, and the malar, nasal and palatal connections of the diseased mass successively divided, the external parts which readily united, scarcely leaving any deformity visible. Mr. Syme is in error in dating either the curvilinear incision, or the present mode of detaching the osseous parts in such exsections, as having commenced with or taken their origin or departure from an exsection he made of the superior maxillary bone, in 1829, (*Edinburgh Medical and Surgical Journal*, July, 1829.) Dr. Mott had many years before that date always adopted the curved incision in question in his exsections of both the upper and lower jaw bones,) see his cases at the end of this volume,) also Prof. Velpeau was, we believe, anterior to Mr. Syme in this matter, (see his letter to Dr. Mott, also Dr. Mott's Remarks appended thereto, Preface to Vol. I. of this work.) It is inexact, therefore, for Mr. Syme to assert, (Cormack, *ib.*, *loc. cit.*, p.

496) that in operations either on the upper or lower jaw, it had hitherto "always seemed necessary to make a double or complicated incision, so as to permit the formation of a flap exposing the fore-part of the bone." Mr. Liston may have done so, (*Loc. cit.*, p. 497,) but at all events this has never been the practice with Dr. Mott. Nor in ordinary cases has Dr. Mott generally found it necessary to divide the cheek at all as Mr. Syme does, in order to have space to remove "tumors of the gum and lower part of the superior maxillary bone;" the raising of the lip up, and dissecting it upwards to the proper extent, from its connections with the jaw at its bucco-maxillary groove, commissure or attachment being quite sufficient for the clean excision of the whole alveolar process to, or considerably above its union with the superior maxilla, which operation, in many osteo-sarcomatous enlargements is frequently all that is required to arrive at the sound portion of the bones, provided the operation is performed early in the disease. In a delicate little girl, aged 7, of West India birth, and therefore more liable to possess, as she did, a highly organized nervous temperament, Dr. Mott, in a case of this kind, was obliged, from the hot season and the danger of spasms, to make three successive halts or short stops in the operation, which he would, under such circumstances always enjoin; as it is surprising how quickly the little patient thus refreshed by a few moments on the bed or its parent's lap, (as in this case,) and a mouthful or two of wine and water, and some pleasant stimulating salt to the nose, was invigorated, and how much better enabled to sustain the mutilations which were to be made, and which, it must be confessed, are calculated to produce much pain. Dr. Mott, as he generally does in such cases, where the incisors, cuspid, bicuspid and one or two molars only are involved in the livid, fungoid, hypertrophied border of one side only, began by extracting the teeth which were loose and easily detached, then plunged a very narrow-bladed, sharp, straight bistoury through the mass at the posterior extremity of, and quite above, the diseased soft parts and degenerated alveoli. Immediately inserting a stiff, straight, narrow saw, of corresponding shape and width of blade, through this aperture, he rapidly sawed from above downwards; then doing the same on the other extremity of the diseased parts in front, the mass thus bounded by the two short, transverse and perpendicular divisions, was readily excised by a curved saw which united the upper extremities of these divisions, by scooping out, as it were, all the altered structures, making horizontally to the extent of from two and a half to three inches, a curved connecting cut with its convexity upwards, and completely through the healthy bone, and above the disease.

[The upper jaw has been removed for the purpose of extirpating a supposed disease of the antrum, but which has proved to have a very different origin. Professor Syme has reported, in the *Edinburgh Medical and Surgical Journal* for October 1832, p. 323, a case in which he extirpated the upper jaw, but the morbid growth, instead of being attached to the antrum, was found to adhere not only to the whole of the upper and lateral margins of the left pharyngeal opening of the nostril, but also to the base of the skull. This patient died very suddenly and unexpectedly, on the morning of the third day after the operation.

Mr. Prescott Hewett, of St. George's Hospital, London, after removing



the upper jaw, discovered that the morbid growth had no connection with it, but was situated behind it, being attached to the pterygoid process, and filling the sphenoidal sinuses. This patient died very soon after the completion of the operation. His death was attributed by Mr. H. to the use of chloroform, which, by suspending the irritability of the glottis, permitted the blood to enter the trachea, which, with the bronchial tubes was filled even to their minute ramifications with frothy blood. In both of the above cases the nose was filled with a polypus of a fibrous character. Mr. Hewett's interesting case may be found fully detailed in the 34th volume of the *Medico-Chirurgical Transactions*, p. 43. It is well calculated to illustrate the difficulties which sometimes attend the diagnosis of morbid growths in the superior maxillary regions. A case, however, occurred at the *Hôtel-Dieu*, of Rouen, in which M. Flaubert, the son, correctly diagnosticated the nature and attachments of the tumor, which was situated in the posterior part of the pharynx, and ramified in the sinuses of the ethmoid and sphenoid bones. He removed the bone with the object of facilitating the extirpation of the morbid growth, with the full knowledge that it was not itself involved. This operation was performed in 1839, and is fully reported in the *Archives Generales*, for August, 1840, p. 436. It was completely successful, so far as the operation was concerned, but sufficient time had not elapsed at the time of the report, to learn the final result. It is stated that the fibrous character of the tumor encouraged them to hope for a perfect cure. Now this fibrous character is precisely that which Dupuytren regarded as rendering a polypus of the nose certainly and speedily fatal if allowed to proceed. During the past year (1853,) M. Maisonneuve removed the upper jaw to facilitate the extirpation of a morbid growth having its origin posterior to the maxillary bone. G. C. B.]

No. IV.—*July 8th, 1841.*—A NASAL OPERATION FOR THE REMOVAL OF A LARGE TUMOR—*filling up the entire Nostril, and extending to the Pharynx.*—By VALENTINE MOTT, M. D. (*See the American Journal of the Medical Sciences, Philadelphia, 1843. New Series, Vol. V. p. 87-91.*)

When the following operation was announced in the No. of this Journal for January, 1842, I was not aware that any one had operated in a similar case. It having been asserted that Professor Syme, of Edinburgh, had performed the same operation, I immediately addressed a letter to him on the subject, describing my case, and requesting to know if he had met with anything like it. He promptly and kindly replied, and states, "you will find a case somewhat similar, in the 9th Report of the Edinburgh Surgical Hospital, published in the Edinburgh Medical and Surgical Journal, for 1832, the 34th Vol. There is another recorded by M. Flaubert, of Rouen, in the Archives Gen. for August, 1840."

The case, which was published in the Edinburgh Medical and Surgical Journal, for 1832, is of trifling extent compared with the one we have described. The operator first divided the upper lip to the septum nasi, turned the flaps aside, and detached the lip from the jaws so as to expose the tumor without detaching the columna or ala of either side. This he did, "to obtain sufficient room for extracting a large fibrous

polypus, which projected both externally and into the pharynx, but did not succeed." He says, "afterwards, when the symptoms had become much more urgent, I removed the superior maxillary bone, as the only means of relieving the patient from the disease."

M. Flaubert, of Rouen, in 1840, performed the formidable operation of exsecting the superior maxillary bone for a large fibrous polypus of the left nostril, extending to the pharynx. Various attempts to remove this morbid mass were made with wires and ligatures, by the operator and his father, with partial success only. This patient recovered completely with very little deformity. (See *Arch. Gén. de Méd.*, for August, 1840.)

Yesterday, I received a small sheet published by Professor Syme, and extracted from the London and Edinburgh Monthly Journal, for Sept., 1842, containing a second operation for nasal polypus. He found this case of a malignant character, and after cutting off the projecting portion of the tumor, the patient was informed that nothing more could be done for his relief, and was discharged from the hospital as incurable. No evulsion was at any period attempted.

After a short time, the patient returned in consequence of repeated bleedings from the tumor, and urged for the sake of his family to have some operation performed, to give him any chance of having his life preserved.

Professor Syme says, "I resolved to try what could be done for the poor man's relief. An incision was made through the upper lip, from the nostril downwards to the mouth, and the flaps were then separated on each side from the gum, so as to afford free space for examining the attachment of the tumor. It then appeared that the growth proceeded from the septum by a narrow neck not larger than a fourpenny piece, immediately above the connection of the cartilage to the bone, and that there was consequently no difficulty in completely rooting out the disease. I cut through the septum a little way above the lower margin, so as not to interfere with the columna, divided the bone with pliers, and separated the remaining cartilaginous attachments. The surfaces of the wound were then brought together, after torsion of the coronary arteries, and retained by stitches of the interrupted and twisted suture. In the course of a few days, there was hardly any perceptible trace of the operation, and the patient has since continued perfectly well."

These are the only three cases of this operation, as far as we know, on record. Two by Professor Syme, and one by M. Flaubert; they have all been successful, and they are all original. In some particulars they are similar, and yet they are all different. The bones in all the cases were perfectly sound. They are different from what are understood by the upper-jaw operations, as performed by Gensoul and others of Europe, and many surgeons of our own country, in which there is disease of the bony structure, and generally malignant. The present operation, we think, ought to be denominated the nasal, to distinguish it from the ablation or exsection of the upper jaw, for malignant disease of the bone or antrum, or both.

My operation was performed without the knowledge of either Syme's or Flaubert's, and appears to me to be more extensive than theirs, and is as follows:—

Augustus McBurth, cabinet-maker, aged 32, born in Schoharie county, New-York, ten years ago felt a stoppage in his left nostril, accompanied with a dull aching pain, which was much aggravated on taking cold. About one year from the commencement of these symptoms, a tumor made its appearance in the nostril of the same side. At first, it was of a deep red color; but it gradually assumed a lighter hue, and would occasionally project beyond the anterior opening of the nasal fossæ, especially in damp weather. At this stage of the disease, he came to this city, and placed himself under the care of a surgeon, who made several attempts to remove it by forceps; but such was the hemorrhage that accompanied each attempt, that it was deemed unsafe to make any further trials to remove it. After remaining in the city three days, he went to an adjoining state, where several trials were made to remove it by means of a ligature; but as each unsuccessful effort seemed to impart only fresh vigour to its growth, he determined to submit to no further treatment, except to have portions of it removed from time to time, when it should become inconvenient from its size. In 1836, he removed to this city, where parts of it were from time to time removed by forceps and ligature, each attempt being attended with much pain and hemorrhage. His sufferings had now become so exceedingly acute, that for one year he could not sleep in the recumbent position. There was a feeling of distension, conveying the sensation of a wedge forcing forward the jaw bone. In March, 1841, he gave up his business, and urged by the intensity of his sufferings, he was induced to submit to one more trial for its removal by ligature. The wire was in his nose for 11 days, but no benefit resulted from its application. He thinks that from first to last, at least 500 attempts were made to remove it, by about 50 practitioners. In June he applied to me for relief.

The tumor anteriorly and posteriorly, was so firm and dense that very little impression could be made upon it even when firmly grasped by the forceps. After trying several times to get a wire through the nose about the posterior part of the tumor, and getting firm hold of the anterior part with forceps, and the part below the palate with the vulsellum, without being able to make the least impression on it, I determined upon the following operation, having for years been in the habit of recommending a similar one for the removal of the inferior turbinated bone, when affected with carcinoma.

On July 8th, 1841, I commenced an incision through the soft parts a little on the outside of the mesial line of the internal angular process of the os frontis, and extended it downwards to the upper lip which was divided about three lines from the angle of the mouth. Two flaps were then reflected; the inner including the cartilaginous parts of the nose, and the tissues covering the os nasi of the left side; the outer laying bare the bone as far as the infra-orbital foramen. The anterior part of the tumor was now somewhat more distinctly seen, and the nasal cavity was further exposed, by sawing vertically through the os nasi, as far as the transverse suture, so as to avoid the descending plate of the ethmoid. The superior maxillary bone was now divided in a line from the upper part of this cut to a point opposite the second bicuspid tooth, and on a level with the floor of the nostrils. Another section was made from the termination of the last, extending horizontally in-



wards towards the vomer. The osseous parts comprising the os nasi, a considerable portion of the superior maxillary bone, and the os spongiosum inferius were then detached. The connections of the tumor were partially separated; but the disease was so extensive, that a part had to be removed through the anterior opening, before the posterior attachments could be liberated. These having been detached, the larger portion of this extensive disease, which passed into the pharynx and completely plugged up the posterior nares, was removed by introducing through the mouth a large curved vulsellum and forceps, and seizing the mass as it descended into the pharynx.

(Fig. 1.)



Fig. 1 gives a good view of the direction of the incisions in the soft parts, with the cheek turned aside;—the dotted lines indicate the course of the sawing of the bones.

After the operation, gave sol. sulph. morph. grt. x. Evening.—Comfortable, and complains of but little pain.

9th. Had slept well, and is much pleased with the freedom of breathing; no febrile excitement; pulse only 69. Comfortable in every respect, and does not complain of soreness of the wound, around which there is but little swelling; has taken some chicken broth; bowels not having been moved, ordered an enema.

10th. Had slept tolerably well, but at intervals during the night suffered considerable pain; some tumefaction of the face to-day, but not more than is usually attendant on an operation so severe. No febrile excitement, pulse being only 60, but somewhat wiry; free evacuation from the enema last evening; another enema ordered; diet light.

11th. Passed the night well; feels comfortably; swelling of the face less; and complains of nothing but a stoppage of the nostril, caused by a slight oozing of blood; pulse 62; bowels have been naturally moved; allowed to take any light nutriment.

12th. Symptoms as yesterday.

13th. Feels comfortable in every way; swelling of face disappearing; appetite good; has slept well during the night; pulse 64; bowels free.

(Fig. 2.)



17th. Pulse 64; appearance in all respects greatly improved; tumefaction of the face has very much subsided; removed the dressings, and took away the sutures; wound entirely healed by adhesion, except at the points, where the ligatures remain; reapplied short strips of adhesive plaster.

22d. Removed the plaster, and pulled away three ligatures. The patient feels desirous to go out, and expresses great gratification at his entire freedom of breathing, and rapid progress towards recovery.

May 29th, 1842. There is no appearance of any return of the disease, and the patient enjoys better health than he has done for ten years, and works at his trade.

The accompanying figure (Fig. 2) is an accurate like-

ness of the patient, taken from the life; and the line of the cicatrix in the soft parts, as exhibited at the present time, July, 1842.

[We copy from *Braithwaite's Retrospect*, Part XXVIII. p. 146, the following analysis of the reports of M. Heyfelder, Prof. of Clinical Surgery at Erlangen, and of Mr. Butcher, Surgeon to Mercers Hospital Ireland. The former was published in the *Rev. Med. Chir. de Paris*, May, 1853, and the latter in the *Dub. Quart. Journ. of Med.* Aug. 1853.

1. M. Heyfelder gives two cases, in which he extirpated *both* superior maxillary bones, and from the particulars given, he appears to be among the first of those who have performed this operation, if not the first. The disease, in both cases, was of a cancerous nature, and a relapse followed; but the result, so far as the operation went, was quite satisfactory. One of these cases will serve to illustrate both.

CASE.—A. Schmidt, æt. 25, came to the Clinique, June 13th, 1844, suffering from a tumor of the face, which, from his account had commenced a year ago, in the posterior part of the palate, and had gradually involved both superior maxillary bones. The nose was pushed upwards, and flattened; the palatine arch was depressed towards the tongue; the face was affected with œdematous swelling; both respiration and deglutition were impaired, speech was embarrassed, and the sleep broken. The teeth, though loosened, were sound; only two incisors were wanting. The tumor appeared everywhere hard, uneven, and insensible to the touch, and did not pass beyond the boundaries of the superior maxillary bones. The constitution was good; lancinating pains had been felt in the tumor only during the last few weeks.

Dr. Heyfelder concluded that the tumor was of an indolent malignant character, and that the only remedy consisted in the entire removal of both maxillary bones. The operation was performed June 23, 1844. The patient being seated in a chair, the head resting against the chest of an assistant, two incisions were made from the external angles of the eyes to the labial commissures, and the included parts were reflected upwards to the internal angles of the eyes and to the ossa nasi. The flap thus formed was raised towards the forehead, until the infra-orbital ridge was exposed. Then the chain-saw of Jeffray was passed through the sphenomaxillary fissures, and the malar bones were divided; the maxillæ were next separated from the ossa nasi; the vomer and the thinner bones were cut with strong seissors; after which a chisel, applied with moderate force to the superior part of the tumor, was sufficient to effect its separation. The accessions of syncope prolonged the operation, which, however, did not last longer than three-quarters of an hour. Very little blood was lost; torsion and compression sufficed to arrest the hemorrhage. Two hours afterwards the edges of the wounds, from the angles of the eyes to the corners of the mouth, were united by twenty-six points of suture, and cold lotions were applied; there was no reaction nor swelling; the patient could swallow water and broth. Four days after the operation it was remarked that the wounds had become almost entirely united by first intention. In six weeks the patient was presented at the Physico-Medical Society of Erlangen, and on August the 25th he was discharged.

The following was his condition:—There was no deformity of the features; in the mouth there was seen along the median line a fissure

thirteen lines long and three lines broad ; the extirpated parts had been replaced by the tissue of a cicatrix, firm and solid at the circumference, but somewhat softer near the fissure ; the soft palate and the uvula were in their natural place ; deglutition was free, and the tongue in a better state than formerly ; the nose had resumed its usual form and direction ; the face, which before the operation was monkey-like, once again possessed a human expression.

The microscopical examination of the tumor showed that it was of cancerous nature. Six months afterwards, the patient, in good health, went to work in the fields ; but in the summer of 1845, Dr. Heyfelder was informed that another tumor was forming in the forehead.

2. Mr. Butcher relates a case in which he removed from a youth the whole of the right upper jaw, together with the whole of the palate bone of the same side. The disease was a large fibro-vascular tumor springing from the antrum. The patient recovered without any difficulty and with little deformity. Mr. Butcher, also, analyzes the experience and opinions of other surgeons with respect to this operation, and ends with the following practical remarks :—

The practical point deducible from the opinions and experience of these eminent surgeons is, that it is by no means necessary to adhere to any particular line of incisions ; a knowledge of anatomy, and the shape of the tumor, in short, the attendant circumstances of the case will modify them, and determine their course and extent.

In conclusion, there are few points to which I wish especially to direct attention ; and first, with reference to tying the carotid artery, as insisted on and put in practice by Lizards, in his operations on the jaw. Experience has proved that this proceeding is altogether unnecessary. The bleeding will be but trifling after once the flaps are formed, if the surgeon is not rash in the use of the knife ; when detaching the tumor and bone from its posterior connections, the edge of the instrument should be kept close to the osseous tissue, and then the internal maxillary artery will not be endangered. All soft attachments should, if possible, be torn down with the finger, and the very depression and gentle wrenching of the mass from its bed with the forceps will tend to lacerate the vessels entering from behind, and still further avert bleeding. It is an important object to prevent, as much as possible, the blood flowing towards the throat in the early part of the operation, hence the advantage of the sitting posture, and of beginning with the division of the cheek bone before the nasal process of the upper jaw bone itself is attacked, as illustrated in my case.

In operations performed for the removal of either a portion or the whole of the superior maxillary bone, I do not conceive we can avail ourselves of the use of chloroform. I agree with Mr. Stanley, that there is a serious objection to its administration ; for inasmuch as by its influence in annihilating sensibility the irritability of the glottis is weakened, if not wholly lost, so there must be danger of a trickling of blood from the mouth into the glottis, without the excitement of a cough to expel it from the windpipe. The amount of this danger may be considered small, but it is sufficient to know that the apprehended evil has once occurred. Severe as the pain of these operations may be, it had better be endured than the risk of suffocation incurred, which must be



regarded as a possible occurrence from the filling of the pulmonary air tubes and cells with blood. As to the division of the bone, cases will seldom occur where the chisel and mallet will be required; they cause great jarring, and, if possible, should not be used. So likewise may saws be dispensed with, for well-formed cutting pliers and powerful seissors, if the operator possesses the required strength to use them; and by the adoption of the latter, the section can be completed with such comparative rapidity, that the sufferings of the patient are greatly diminished, and the shock abridged, while, at the same time, be it remembered, if the instrument is steadily handled, the bone may be as evenly divided as by any other means, or, practically speaking, sufficiently so to permit healthy repair of the cut edges, a fact very remarkably exemplified in the case of the young man I operated on.

As to the use of chloroform in this operation, we can only say, that we have seen it used by Prof. Ackley, of Cleveland with the happiest effects, and Prof. Gross, in his interesting report on Exeision of the Maxillary Bone (*West. Journ. Med. & Surg.* Sept. 1852,) states that he has resorted to this agent in every severe case of amputation both of the upper and lower jaws, that has come under his observation, and that he has had no cause to regret the practice. He adds, "If proper care be taken to compress the vessels as soon as they are divided, and the head be placed upon a low pillow, no danger can ensue from this source.

I certainly have never witnessed any, and until I do, I shall not hesitate to continue the practice, whatever others may say and do."

M. O'Shaughnessy cautions us against removing any portion of the healthy skin, as the want of it is much more likely to be complained of when the cure is completed, than of there being too much, if the whole has been left. (*Op. cit.* p. 30).

The late Prof. Horner has reported in the *Med. Examiner*, vol. vi. N. S. 1850. p. 16) in which he removed the upper jaw without any incision through the cheek. This method was adopted by Dr. Alexander H. Stevens, in 1823. G. C. B.]

#### ARTICLE VII.—EXSECTION OF THE LARYNX AND TRACHEA.

Necrosis and caries of the os hyoides, and cartilages of the larynx and trachea, may also require exsection. A sequestrum with a fistulous opening into the air passage, (fistule aérienne,) the origin of which J. L. Petit (*Acad. de Chir.*, p. 185, t. II.) ascribed to syphilis, came near falling into the trachea. It became necessary to attach a thread to it until it came away entirely, and afterwards to have recourse to tents of lint imbued with wax and cocoa melted. We must evidently attend in good season to the means of securing a necrosis of this description, which, perhaps, it would be better to detach, and then unite by means of suture, the portion of skin which covered it to the neighboring parts. In a case mentioned by Marehettis, (Bonet, t. III., p. 240, Obs. 40,) the caries was rasped, and thus perfectly destroyed. The fistula existed between two of the rings of the trachea. Having dilated it with a sponge, the rasp could be applied to the diseased cartilages on both sides, which could thus be conveniently scraped. Having laid open the ulcerous passage, I was enabled to excise a portion of the os hyoides,

and to cure a fistula which in one case had existed eight years, and in another three, being two adult patients whom I operated upon with M. Pegot, in 1834, and on the other with M. Leclerc in 1836.

#### ARTICLE VIII.—STERNUM.

The sternum being a spongy, thick and superficial bone, is naturally liable to all the diseases common to the osseous system; consequently attention has been early directed to the modes of laying it bare and of excising or perforating it. The abscesses which form in the anterior separation of the mediastinum, and which are thus imprisoned as it were in the chest, might easily be cured, if an aperture should exist in the sternum. When this bone is carious or necrosed, it may become itself the source of dangerous suppurations, or accidents which almost always ultimately have a fatal termination. [In a case of an old man aged about 70, of broken down constitution, and vitiated by neglected or improper treatment for syphilitic disease many years before, the middle bone of the sternum had been for a long time carious, and finally changed to a true necrosis, and penetrated into the mediastinum, inducing pulmonary symptoms, expectoration and hectic which in a few months carried him off. The autopsy, I found, confirmed my diagnosis and the fetor emitted from the slight perforation which the necrosis had worked through the bone, was remarked as peculiarly offensive. T.]

Whatever Léveillé may say to the contrary, there is every reason to believe that Galen, (Teyrilhe, *Histoire de la Méd.*, etc.) had performed excision upon this bone, in that patient in whom he was clearly enabled to see the pulsations of the heart. De la Martinière, (*Mémoires de l'Acad. Roy. de Chir.*) shows by the observations of Mesnier, Alaree, Sedilier, Lecat and Ferrand, as has been proved also by those of Labisière, J. L. Petit, Ravaton, Genouville, Cullerier, (Champion, *Traité de la Résection*, p. 42,) Boyer, (*Malad. Chir.*, t. III., p. 526,) Jæger, (*Gas. Méd. de Paris*, 1833, p. 645,) and Gilette, (*Journ. Hebdom.*, t. II., p. 228,) that excision or trephining of the sternum is very frequently indicated. Còlombus Purmann, (Champion, *Op. cit.*, p. 41,) and Marchettis, therefore were right in recommending it or in having recourse to it. Guillemeau, (*Œuvres de Chir.*, p. 651, 1649,) had already recommended the trephine for extracting a ball buried in the sternum; De La Martinière, (*Mém. de l'Acad. de Chir.*, t. IV., p. 545, in 4to,) in a case of fracture extracted four fragments of the bone by means of the elevator; M. Mosque, (*Application du Trépan au Sternum*, p. 13, No. 439, *Thèse de Paris*), mentions a fracture of the sternum with depression, and complicated with emphysema and effusion, which were laid bare by the trephine. An individual received the ball of a pistol, the muzzle resting on the sternum, and the ball was lost in the chest. The parts were dilated, splinters removed, the trephine applied, and the wadding and portions of the clothing extracted, which was followed by taking half a palette of blood. The patient was at the point of death, says Ravaton, (*Chir d'Arm.*, p. 215—239, obs. 50;) the ball was not extracted till the thirteenth day, but the case notwithstanding got well.

In the case related by Galen, (*Opera*, lib. VII., cap. 13,) and which

occurred in the servant of Marcellus, the disease was caused by a kick on the breast, "abscess after four months, incision, cicatrization; new inflammation and abscess, cicatrization impossible; consultation of physicians; all pronounce the disease a sphacelus with corruption of the chest. Afraid to penetrate into the chest, no one dares attempt to exsect the diseased bone. Galen promises to remove it without opening into the chest; but without guaranteeing to make a perfect cure of the case! The part being laid bare, no other portion of the sternum was found diseased, which inspired courage and confidence in the operative process. Having cut through the corrupted bone at the place where it is adherent to the point of the sheath of the heart, and the heart being visible through it, because its sheath or pericardium was rotten, Galen and his assistants formed a bad prognosis of the case; nevertheless he recovered perfectly in a short time."

We should not, however, decide in these cases upon exsection unless the existence of an abscess underneath the sternum was positively indicated, or unless it was evident by the fistulas or the explorations with the probe, that there was a caries or necrosis in the neighborhood. I have once performed this operation under these circumstances. It was for a necrosis of long standing and altogether local; I required only the gouge and mallet to destroy it completely, as it did not penetrate to the mediastinum. In some cases we are obliged to make use afterwards of the hot iron to cradicate the remains of the caries. The trephine also often becomes indispensable, not that it is useful, as Duverney, (*Malad. des Os*, t. II., p. 448,) has strangely supposed, to leave in its place the boney disc circumscribed by the trephine, after having sawed around it; but because it would be difficult to penetrate the sternum through and through, in any other manner. At the present day, however, the concave rowels enable us to excavate the bone so extensively and so deeply, that the trephine would no longer be required except to penetrate directly to the anterior separation of the mediastinum; by means of the osteotome of M. Heine, M. Dietz, (*Gaz. Méd.*, 1834, p. 644,) or Jæger, (*Jæger, Operat. Resect.*, &c., p. 17,) was enabled to remove a semilunar portion of the length of two inches. (See *Trephining*.)

Here, less than in any other part of the body, ought the wound to be united by first intention; the dressings therefore should be flat, and as I have described in the preceding exsections.

#### ARTICLE IX.—THE VERTEBRÆ.

By their nature and their functions, and especially by their deep situation, the vertebræ unfortunately are out of the reach of the action of surgical instruments, at least so far as regards their body and transverse processes. The spinous processes, however, have already been several times successfully excised. In operating at the Hotel Dieu on a woman with a tumor at the nape of the neck, Dupuytren removed at the same time the spinous process of the seventh vertebra. M. A. G. Smith (*Jour. des Progrès*, t. XVII., p. 281, *Jour. Hebdom.*, t. V.) also removed the spinous processes and laminae of several of the dorsal vertebræ in an individual who had depressed them in, and was paraplegic, in con-



sequence of a fracture in this region. The operation, says the author, was followed by perfect success, as his patient recovered the faculty of walking.

This excision, which was advised also by Vigaroux, (Hevin, *Cours. de Pathol.*, etc., t. II., p. 205,) and by M. J. Cloquet, was also performed twice by M. Tyrell in 1822 and 1827; by Cline (Olivier, *Maladies de la Moelle*, etc., p. 222, Jæger, *Op. Cit.*) in 1814; by M. Wickham in 1817, and also by another English surgeon. M. Heine (*Gaz. Méd.*, 1834, p. 645) also aided by his osteotome has not feared to undertake it. M. Roux also was obliged to have recourse to it in removing an enormous cancerous mass from the back in a patient whom I saw, and M. Holscher had done the same in 1828.

Without admitting with Bartholin, (Bonet, *Corps de Méd.*, t. IV., p. 555,) who, on the testimony of the Duke of Lunebourg, affirms that two of the dorsal vertebræ were carried away by a cannon-ball without causing the death of the patient, I will nevertheless allow that the excision or exsection of every projecting part of the spinous processes or of the vertebral laminæ, does not appear to me to have anything in it impracticable or even unreasonable. Having therefore laid bare the root of these osseous projections by means of suitable incisions, I would recommend that we should excise the spinous processes with the simple cutting pliers, or if the laminæ of the vertebræ were to be removed, with the crested saw or rowel saws either of M. Heine, M. Légeuillou or M. Martin. As the spinal marrow lies some lines in front, the instrument would not wound it if the surgeon took the precaution of not going beyond the plane of the roots of the transverse processes. So long as it concerns only the spinous process, the operation cannot, properly speaking, be either very serious or very difficult. If the vertebral plates, however, are to be penetrated, there will be real danger, less on account of the risk of traumatic lesions to the spinal marrow, than on account of the inflammation which may soon be produced in the interior of the arachnoid cavity, or on the surface of its appropriate membrane. We must guard therefore in such cases against approximating the lips of the wound, and not fail to dress it lightly and with the aid of small balls of lint, in order that cicatrization may only take place by second intention.

[During the month of November, 1854, I exsected about one and three quarter inches of the upper and posterior wall of the sacrum. The patient, Mr. Simon Ostrander, a well known citizen of Newburgh, N. Y. was 44 years of age. Four years and five months previous to the operation he fell backwards through a hatchway in a store, and was found in an insensible condition. In a few hours he regained his consciousness, but motion and sensation in his lower extremities were entirely destroyed. Both urine and fæces were voided involuntarily. In this miserable condition he had dragged his body around for the long period above mentioned and was anxious to submit to any operation I might propose. As there was some irregularity at the point already designated, and the patient himself a very intelligent gentleman, seemed to be positive that it was the seat of all his difficulties, I decided to expose, and if appearances warranted, to remove the posterior wall of the spinal column. A single large flap was raised sufficient for the first

named purpose, and all present expressed their conviction that the posterior wall was depressed. Being well satisfied of the fact I removed the spinous process of the upper bone of the sacrum, with a pair of strong bone nippers aided by a Hey's saw. A trephine was now applied and through the opening thus made the bone nippers were introduced and about one and three quarter inches of the posterior wall of the sacrum removed. Considerable hemorrhage followed the laceration of an artery passing from the coverings of the spinal cord to the bone. Owing to its retraction it was found impossible to secure it either with the tenaculum or forceps, and I was obliged to resort to pressure with a sponge. The operation was performed about 3 o'clock, P. M. and during the night for the first time after the accident, the patient became conscious of the passage of his urine. The next day he experienced strange sensations about the rectum, and was aware of the evacuation of his fæces. Instead of being of an icy coldness, his extremities became warm, and he complained whenever a needle was thrust into his flesh. About the third day after the operation, on tickling the sole of either foot, his legs would be flexed to an acute angle with the thigh. Five weeks have now Jan. 2. elapsed, since the operation, and strange to say, during the past fortnight he has gained considerable voluntary power in moving his limbs, as was satisfactorily demonstrated both to Dr. Ely and myself on Christmas night. The wound healed speedily, with the exception of a very narrow orifice through which healthy pus is occasionally discharged. The operation was witnessed by numerous physicians of Newburgh and its vicinity, several of whom have watched the progress of the case and have expressed their astonishment at the result. Its subsequent history we shall endeavour hereafter to communicate to the profession. In December, 1854, we operated in another case, on the same day of the accident, but in this the injury was in the upper dorsal vertebræ, and proved fatal in eight days. G. C. B.]

#### ARTICLE X.—THE RIBS.

Among the exsections of the bones of the trunk, there is one which has more especially attracted the attention of modern observers: I mean exsection of the ribs, performed in other times by Galen, Levaecher, (*Mercure de France*, Avril, 1758,) Gooch, (*Gaz. Salut.*, No. 28, 1775,) Sédiller, Leeat, (*Prix de l'Acad. de Chir.*, t. II., p. 34, 12mo,) Ferrand, M. Larrey, (communicated by M. Jacquier to M. Champion, 1807,) Beullae (*Soc. Méd. de Marseilles*, 1817,) &c.; an operation which it is said the Hindoos (Indiens) also frequently practise in the treatment of *Cawso*, (*Journal Univers. des Sc. Méd.*, October, 1818,) and which they designate under a particular name. The ancient *Journal Encyclopédique* contains a singular case of this exsection. Suif excised two ribs from a man named Botaque, in such manner as to be enabled to introduce the fist into the chest. A portion of the diseased lung was removed, and the patient got well! Nevertheless, it was scarcely thought of any more, until in the year 1818, when M. Richerand (*Bull. de la Fac. de Méd.*, t. VI., p. 104) performed this operation upon an officer of health, affected with cancer of the thorax. It is known that since then M. Cittadini (*Arch. Gén. de Méd.*, t. XVIII.) has twice perform-

ed it with success in Italy. Perey (*Dict. des Sc. Med.*, t. LXXII.; *Jour. de Med.*, 1820, t. LXXIII., p. 354,) also states that he performed it successfully on an officer named Muller, who had two of his ribs carious, caused by a gunshot wound. The Journals also relate that it has been made trial of also at the hospital Beaujon, by M. Blandin, at La Charité by M. Roux, and in America by M. Mott. The case of M. Richerand is unquestionably the most remarkable of all. It became necessary to remove the middle portions of four ribs to the extent of several inches. The pleura which was greatly thickened, had also to be removed, so that the pulsations of the heart in the pericardium were exposed naked to the sight. The results of this operation at first were of the most satisfactory nature; but at the expiration of a few months before the wound had completely cicatrized, the cancer regerminated and ended in death.

*Operative Process.*—The patient being placed upon his back, if the disease is in front, and on his belly if it is behind, and on the side in all other cases, is to be held securely in his position by the assistants. A pillow or cushion is to be placed under the opposite flank, in order to raise up and stretch the diseased side. After having laid bare the rib or ribs we propose to exsect, and prolonged the incisions in front and behind beyond the extent of the disease, we make use of a crested or chain saw, or a rowel-saw, either flat or of the mushroom form, or we use only the kind of pliers which is employed in the amphitheatres, and known under the name of the sector. This last mentioned instrument, however, would have to be modified if we use it on living man. Its blades would have to be narrower and sharper, in order to take up less space and to avoid wounding the soft parts. Its branches also should be longer by one-third, in order to give the operator more power. Constructed in this manner it has appeared to me to render the operation very simple in the three cases in which I have employed it. We commence with either extremity of the rib and finish with the opposite one; it is, however, better to make the section on the posterior part of the rib first. We must take particular care to avoid wounding the pleura, which, as has been noticed by all observers, is ordinarily in these cases manifestly much thickened. If, however, it should be found to be extensively diseased, and especially if it is the seat of a cancerous degeneration, we must not hesitate in removing it. Herissant, (*Acad. des Sciences*, 1648, p. 71,) who opened it by mistake, had no reason to repent of having done so. To escape wounding this membrane, which, according to Botal, Galen succeeded in avoiding, though he removed an entire rib, it is important to scrape carefully each border of the bone, and not to incline the point of the bistoury towards the intercostal space. Before going any farther we should detach its inner surface with the blunt point of a curved sound, or draw it outside and towards us by means of a blunt hook. In this manner we divide only the inferior artery in each rib that we take away. The blood also in certain persons flows copiously during the operation, and authors have done wrong in omitting to notice this hemorrhage. Fortunately tamponing properly applied, is almost always sufficient to put a stop to it; for it would be a difficult matter to seize the arteries in order to twist or tie them. The wound being irregular and contused is to be dressed flat; and we should



incur the risk of serious dangers if we attempted to heal by first intention.

*Appreciation.*—Exsection of the ribs which is recommended in general terms by Celsus, (*De Re Med.*, lib. VIII., c. 2,) by Soranus, (Champion, *Traité de la Résect.*, p. 44,) in cases of compound fractures; by Arcæus in order to dry up certain fistulous discharges; and which was actually performed in cases of caries and necrosis by Séverin, (Champion, *Traité*, inéd., p. 44,) J. L. Petit, (*Œuv. Chir.*, t. II., p. 25,) Duverney, David, Lapeyronie, and Desault, (Champion, *Op. cit.*, p. 44; *Jour. de Chir.*, t. I., p. 317,) is an operation neither very dangerous nor very difficult. Besides the practitioners whom I have mentioned above, MM. Anthony, McDowell and Jæger, Coulon, *Thèse*, Wurtzburg, 1833,) have also performed it with success. Aymar (*Bonet*, t. IV., p. 95, obs. 105, 96) in a case of scirrhus removed three inches from the fifth, sixth, and seventh left ribs. Moreau, (Champion, *Traité de la Résect.*, p. 50,) who was obliged to remove a portion of the sternum at the same time with the fifth and sixth cartilages of the right ribs, succeeded in curing his patient. M. Clot, (*Jour. Hebd.*, 1835, t. II., p. 296, 297; *Compte-rendu de l'Ecole d'Abouzabel*, 1832, p. 50,) in removing the second rib in a carious state in one case, the sixth in another, and the seventh and eight in a third, was no less fortunate. M. Warren who extirpated the seventh rib in a case of osteo-sarcoma, afterwards the sixth and seventh affected with caries in another patient, and M. Textor, who in 1837 extirpated the tenth or eleventh ribs also in a carious state, were equally successful. I have myself performed the operation three times, and none of the cases died. This, however, is no reason for deciding upon the operation lightly. The patient of M. Roux died in consequence of the operation, so that without admitting with Lassus that caries of the ribs is an incurable disease, I am ready to allow that it may exist for a great number of years without impairing the general health. The operation, moreover, has caused the death of many other patients.

[The most remarkable case of exsection of the ribs which we have been able to find on record is that reported by Milton Antony, of Georgia, in the *Philadelphia Journal of the Medical and Physical Sciences*, Vol. VI. 1823, p. 108. The report is accompanied with a plate. In this case there was extensive caries of the fifth and sixth ribs, together with a disorganization of the greater part of the right lobe of the lungs. The carious ribs were removed, with “two thirds of the right lobe of the lungs”! The operation was performed on the 3d of March, 1821, and the patient lived until the 11th of July, of the same year. There are many interesting facts connected with this case which our limited space will not permit us to mention.

Another extraordinary case is related by Dr. John H. B. M'Clellan, in the edition of his father's work on the *Prin. and Pract. of Surgery*, p. 352. In this instance, the late Dr. Geo M'Clellan removed a tumor involving the sixth and seventh ribs, on the right side, and which extended from their cartilages nearly to the dorsal vertebræ, being ten inches in its longest diameter. It projected externally at least four inches from the surface of the ribs, and about the same distance within them, pushing behind it the pleura, and it had nearly destroyed the functions of the lung by its encroachment. The tumor was a genuine spina ventosa.

After separating the integuments, the morbid parts were removed with the chain saw and bone nippers. There was considerable hemorrhage, but it was soon arrested by the application of patent lint slightly moistened with creosote. "The cavity, as then apparent, was really enormous—the largest I have ever seen made upon the human body; without the slightest exaggeration, it would have admitted into it with ease, a child's head of the ordinary size at birth. It not only extended as before described in length, but internally projected, both above and below, much beyond the two ribs involved, and exhibited the smooth and polished surface of the pleura costalis which had been separated from the ribs, and pressed back upon the lung in the advancement of the disease." The patient speedily recovered from the operation, but died about ten weeks afterwards from remittent bilious fever, which "assumed the worst form of the congestive fever of the south-west."

Dr. McClellan operated in a very similar case, in 1836, and this patient was in perfect health some ten or twelve years afterwards (*op. cit.* p. 354.) In another case he removed the ossified cartilages and the anterior extremities of two carious ribs, together with the lower portion of the sternum. This patient was living 20 years after the operation. (*Phil. Med. Exam.* Vol. VI. 1851). Dr. John C. Warren has had two very interesting cases of exsection of the ribs which may be found reported in the *Bost. Med. Surg. Journal*, Vol. XVI., p. 201,—1837. But to these we can only refer. M. Jaquet, of Brussels, in excising portions of two of the ribs affected with caries, wounded the pleura, yet his patient recovered. MM. Marchal (de Calvi) and Sinoli have also operated in a similar case. Prof. Gibson removed an osteo-sarcomatous tumor involving the ribs, which required the exsection of the latter. The case is reported in his *Institutes of Surgery*, 7th ed. Vol. 1st. p. 421.

Some two years since, during a temporary residence in France, we were consulted by a provincial surgeon in a case, not unlike the first of those above mentioned, in the practice of Dr. McClellan. Prof. Eve of Nashville afterwards saw the case with us, and was of our opinion, that the success attained by Drs. McClellan and Warren, was sufficient to warrant an operation. But, from this, he was dissuaded by M. Velpeau, who subsequently saw the case, and none was performed. The tumor was rapidly increasing and has probably long since destroyed the patient. G. C. B.]

The excisions of the true ribs must always be a serious operation. It is true that when the disease is situated in one of the three last we are in no fear of wounding the viscera of the thorax; but we are not to forget that we are then in the neighborhood of the peritoneum and the abdominal organs. The two floating ribs, moreover, require some special precautions. As they are free at their anterior extremity, it is important to support them with a hook in this direction, while we are isolating and dividing them posteriorly. From their great mobility the sector is infinitely more convenient for making their division than any other instrument, and their section anteriorly becomes unnecessary. Adopting these precepts I was enabled to effect the exsection of the twelfth rib on the right side in a young man aged seventeen, without any very great difficulty.

Another circumstance not to be forgotten is this, that the caries or

neerosis which we propose to remove may be only the symptom or effect of a deep-seated disease, and may not be limited, as we might be tempted to think. In four men who solicited me to perform the operation, and which I declined to do, the affection of the ribs in one case originated from caries of one of the vertebræ, and in the others from pulmonary tubercles. In conclusion, this exsection is not to be performed unless the disease, besides being circumscribed, is altogether local, or unless by its presence it threatens to give rise to serious accidents.

#### ARTICLE XI.—THE PELVIS.

Many points of the bones of the pelvis project so much outwardly as to have naturally suggested to the minds of surgeons the idea of attempting their exsection.

##### § I.

The *coccyx* and *point of the sacrum*, among others, have often been removed for caries or neerosis, whether caused by a fall on the breech or by any other force, or by some internal disease.

Bourleyre (*Anc. Jour. de Méd.*, t. XLIII., p. 316) gives the history of a caries which perforated through and through the sacrum. The bone in its middle portion was denuded to the size of a sou, and pierced from above downwards; but no treatment was used but that of bourdonnets, (see Vol. I.—rolls of lint,) saturated with mercurial water, (proto-nitrate of mercury.) Champeaux (*Gazette Salulaire*, 1769, No. 31, p. 3) mentions the case of a female aged thirty-six years, who in consequence of falling upon a cart wheel from a height of more than twenty feet, had a neerosis of the sacrum. A longitudinal incision from the middle part of the bone as far as the extremity of the os coccygis, enabled the surgeon to ascertain with his finger that the sacrum was fractured throughout the greater portion of its extent, and that most of the splinters were loose. He thus extracted by means of the forceps more than twenty pieces of bone, and the cure was accomplished at the expiration of two and a half months.

The operation, moreover, in such cases is so easy that it scarcely requires to be described. The patient should have a pillow placed under the belly, and ought to lie down in that position on the border or foot of the bed. Nor would there be any objection to placing him in the same manner as for the operation of fistula in ano or for stone.

The sides of the breech being then held apart, the surgeon incises upon the median line from the neighborhood of the anus to the posterior surface of the pelvis; then separating the lips of the wound as he continues to detach them, he prepares for seizing hold of and raising up the diseased bone. For that purpose a good pair of forceps will answer if the osseous fragment is moveable; in the contrary case he proceeds with a mushroom-shaped saw, if there is only a superficial neerosis or caries, or with the flat rowel saw in case of a deep-seated lesion, to cut through the whole thickness of the bone, at some lines outside of the diseased region. A chisel or spatula, or any other solid lever, inserted into the track of the saw, would then suffice to detach the bone and



thus complete its exsection. Seizing it then with an érigue, a forceps or the fingers, nothing more remains, in order to extract it entirely, than to gradually detach from it the fibro-cellular tissues upon its borders and its deep-seated (internal) surface. The wound being dressed with balls of lint, the perforated linen and a plumasseau, (see Vol. I.,) would require moreover the same kind of bandagè as all other wounds of the anal region.

M. Van Onsenort, who extirpated the os coccygis in consequence of a fistula kept open by a caries of this bone, proceeded in the following manner. With the fore-finger of the left hand introduced into the rectum he supported the rectum. An incision was then made on its middle part, from the base to the apex of the bone. By means of a transverse incision made on a line with its point, he was enabled to detach this latter and to separate the soft parts from the inner side of the coccyx. The operation terminated with disarticulation, and the patient promptly recovered without any accidents. M. Kerst has seen a case in which the coccyx was entirely detached from the sacrum and expelled spontaneously. The patient ultimately recovered.

[The *os coccygis* has been recently extirpated by Dr. Nott, an American surgeon, (See Amer. Journ. of the Med. Sciences,) in a lady, aged 25, for severe neuralgia—a diagnosis of the condition of the spine indicating extreme tenderness over that bone. The incision was made down to the bone two inches in length vertically upwards from the point; the bone was then disarticulated at its second joint, the muscular and ligamentous attachments divided, and the two terminating bones dissected out without much difficulty. The last one was found carious, hollowed out to a mere shell, and the nerves exquisitely sensitive. The operation, though short, was attended with extreme suffering, and the pain afterwards violent for hours, coming on every ten or fifteen minutes, and accompanied with a sensation of *bearing down* like labor pains. At the end of a month, all medicaments proving of no avail, the pains subsided, the wound healed, and the general health was much improved. At the next catamenial period, she suffered severe pains and tenderness in the vagina, which were ultimately effectually cured by *citrate of iron* in five-grain doses three times a day. T.]

## § II.

The *tuberosity of the ischium* could without doubt, should its diseased condition require it, be exsected in the same way as the great trochanter. Maunoir (*Questions de Chirurgie, Traité des Ulcères*, p. 164) has published a case of this kind. The caries had proceeded to great extent. After the incision two cauterics were applied, heated to a white heat, and then recourse was had to tamponing, *i. e.*, plugging or tenting a wound, (see Vol. I.) Two months later, and after repeated attempts, the surgeon succeeded in extracting a portion of the ischium of the size of a small pullet's egg, when a cure was effected. But I have not been enabled to ascertain that any person since up to the present time has ever suggested or any other surgeon had occasion to perform this operation.

## § III.

It is not, however, altogether the same with the *spine of the ilium*. The extent and superficial position of this border of the pelvis, expose it to the action of external violence of every description. Thus is it often the seat of fractures, contusions, and also of caries and necrosis. Abscesses at the bottom of the gluteal region and in the internal iliac fossa, have also more than once led to the necrosis, and afterwards to the perforation, of the ilium. It is easy to conceive, therefore, that it may be advantageous to remove a portion of it in order to preserve the remainder. It is asserted that Leauté (*Le Dran, Obs. de Chir.*, t. II., p. 265) once exsected the spine of the ilium successfully. De Lamarinière, who recommends trephining the iliac fossa, was imitated by Boucher, (*Séance Pub. de l'Acad.*, in 4to, Paris, 1779; Sprengel, t. III., p. 33,) who thus gave egress to an internal abscess in the pelvis. Manne, (*Traité Elém. des Maladies des Os*, p. 186, 1789,) having met with a comminuted fracture [of the ilium] had recourse to incisions to raise up or extract the displaced fragments of bone, and applied the trephine to the neighboring portion in order to raise up those portions which the elevator could not adjust, and to extract the foreign substances. A fact noticed by Arrachard (*Mém. de Chir.*, p. 269, 1805) at the hospital of La Charité, proves indeed that the bones of the ilium may thus be nearly all removed without causing death. Theden (*Nouv. Obs. et Expériences pour enrichir la Chirurgie et la Médecine*, 2e part., chap. III., p. 48-49) speaking of the trephine for the hip, cites a case in which a ball was accidentally lodged in the pelvis, and extracted by means of this instrument. Weidmann, (*Traité de la Necrose*, p. 111) also has seen a sequestrum in the diploe of the ilium, enclosed in a new bony encasement, without any external opening being noticed in its neighborhood. I have met with two patients who would evidently have derived some advantage from exsection, if they had been willing to submit to it. I have seen two others, in whom, if the trephine had been applied to the bottom of an abscess in the external iliac fossa, the necrosed portion of the bone might have been easily removed.

The process to be followed would be simple and easy. An incision, parallel with the border of the pelvis, to be prolonged in front and behind an inch beyond the limits of the diseased portion, would ordinarily suffice. Separating the lips of this wound apart by dissection, we could, if it were necessary, detach, without fear, the lower one, as far down as on a line with the insertion of the gluteus minimus muscle. In order to avoid the anterior circumflex artery, it would be necessary to graze very near the bone, while pushing to the inner side the upper lip of the wound. It is easy to perceive that, by means of the crested or the ordinary saw, directed transversely from without inwards, while the abdomen was protected by a piece of pasteboard, wood, or fold of linen, we would be enabled to remove the diseased portions of the spine of the ilium to any extent desirable.

Should the affection consist only of a very circumscribed point of necrosis or caries, it could also be removed with the mushroom-shaped rowel saw, or by the chisel.

At the bottom of the iliac fossa, there could be no fixed rules for the operation. One or several incisions to lay the bone bare, and one or more applications of the crown of the trephine, unless we should prefer the rowel saws of M. Charrière, or the osteotome of M. Heine, is all that we can indicate of the general course to be pursued.

[These limited carious or *necrotic* affections are sometimes, though rarely, seen on the crest of the ilium, in marasmal, broken-down cases, from improper treatment of syphilis. The *purulent diathesis*, which is occasionally noticed in such cases, will also, as I have seen, attack the thin layer of superincumbent tissues on the antero-superior and antero-inferior spinous processes, after which the suppuration involves these prominences in caries, laying bare a portion of the cavity of the pelvis upon the internal iliac fossa. Yet I have seen a case of this kind which gave no pain, care or trouble to the patient, and where this *dark hole* into the pelvic cavern had existed for a year, was accompanied by no discharge, but presented, to say the least of it, a very curious appearance. T.]

#### § IV.

The *pubes* themselves also may be submitted to exsection. Desault (Chopart, *Maladies des Voies Urinaires*) mentions a lesion of the bladder, caused by a splinter of the pelvis; the fragment was extracted, and a sound placed in the urethra, when the patient got well. A sequestrum of the pubis having made its way to near the groin, caused an abscess, and afterwards an ulcer, which reopened and closed up several times without effecting a definitive cure, until the splinter of bone itself was expelled, which was nine lines long by two in breadth, (J. L. Petit, *Œuvres Posthum.*, t. II., p. 33.) A portion of more than two inches of the pubis, which had been fractured and become detached, was removed by Maret, (*Mém de l'Acad. de Dijon*, t. II.;) the horizontal position, with flexion and eversion of the thigh, in order to prevent the narrowing of the pelvis, enabled this surgeon to obtain a callus which filled up the void left by the loss of substance of the bone, and accomplished the cure in a short time.

#### ARTICLE XII.—THE THORACIC EXTREMITIES.

When the disease occupies the limbs, we have reason to hope that, by excising some portion of the body of the bones, we may render amputation unnecessary, and preserve certain important organs to the patient. Whether it be caries, or necrosis, or any other morbid production whatever, it is easy to conceive that, in order to destroy the totality of the disease, it will be sufficient to remove with it the whole thickness of the calibre; at other times, only a plate of the bone. In this manner, everything above and below the disease is so much gained to the organism, and the surgeon in reality destroys only the portion which it is impossible to save. We thus avoid removing a great extent of sound parts for a small extent of diseased tissues. Viewed under this aspect, exsection of the bones in our times has made substantial acquisitions. Thanks to the labors of Hey, Moreau, Champion, Jæger, and Roux, and



a multitude of modern practitioners, we no longer perform amputation of the limbs for an isolated disease of some of the bones which enter into their composition. Nevertheless, we must guard ourselves against falling into the opposite extreme or that in which surgeons had so long continued. To be enabled to substitute with advantage exsection of the body of the bones for amputation, we must be sure of removing the whole of the disease. But every one knows that it is usually exceedingly difficult to establish the limit of a caries or necrosis. Without that, however, the patient incurs the risk, after having undergone an operation which is generally tedious and difficult, of being obliged to submit also to amputation.

All other things being equal, amputation is more prompt and easy, and more certain in its result, than exsection. The latter, which necessarily exacts a delicate dissection, and multiplied incisions, and more numerous explorations, and which leaves irregular, extensive, and more or less contused wounds, is, on the other hand, accompanied with less danger to life, and possesses the immense superiority of not mutilating the patient, and of *only altering sometimes, but not abolishing the functions of the part.*

In fine, in order that exsection should have the preference, there should be no doubt as to the importance of the organs which it will enable us to preserve, or as to the possibility of our leaving the articulations intact, while at the same time we remove the whole disease.

Caries being ordinarily very circumscribed in extent, scarcely ever compromising life and almost always becoming ultimately restricted within certain limitations, cannot require exsection, unless it should have existed for a considerable length of time. We may, moreover, say of it, as of gangrene and of diffused inflammations in general, that we should not think of removing it until the constitution has put a definitive terminus to the progress of the malady.

As to *necrosis*, it is a disease so little painful, so slow in its progress, so little serious in itself, and one which gives such trifling inconvenience to the patient, that it would be censurable to commence its treatment at once with surgical remedies. Never can necrosis justify exsection in the *diaphysis* of the bones of the limbs, until the morbid process shall have separated it from the living tissues. Before thinking of the operation, therefore, we should make ourselves perfectly well assured that the sequestrum, or necrosed fragment, already possesses a certain degree of mobility, and that it is positively isolated from the rest of the bone. Until that takes place, the necrosis may give rise to pain, inflammations, and fistulas, and stimulate to incessant suppurations, and that for a number of years, which it is impossible to determine; but this does not make it proper that we should proceed to exsection.

This species of exsection is, moreover, applicable to the *short bones*, as well as to the long and flat bones. In the long bones, it may be had recourse to, both upon the middle portion and the extremities; its characteristic feature lies in this: that it respects the synovial or articular cavities. It also interrupts, sometimes completely, sometimes only partially, the continuity of the diseased bone; and what I have said, in this point of view, of necrosis, may be applied to all the other organic affections of the osseous system.

§ I.—*Bones of the Hand.*

The bones of the hand are charged with such important functions, that we are always exceedingly fortunate in being enabled to preserve any of them. On the other hand, they are so short that their diseases rarely allow our saving the articular extremities, and of destroying only their middle portion.

Supposing it were possible, in certain cases, to remove only the body of the bone, we ought to ask ourselves the question whether the corresponding finger would not thereby become more inconvenient than useful after the operation. Certain facts, however, authorize me in asserting that, in the phalanges, we might remove their middle portion, should their articulations in reality be in a sound state. "When the middle phalanx only is corrupted, [corrompue, *i. e.*, necrosed or diseased. T.] says Lember, (*Comment., ou Œuvres Chirurgicales*, p. 397, 1671, in 4to.) we lay it bare by two incisions—one on each side of the finger—in order to avoid the tendons employed in flexion and extension. If the necessities of the disease should require the section of either one or the other set of these tendons, we are to preserve the flexors. The bones being laid bare, we macerate [*mortifions, i. e.*, in this antiquated phraseology and practice, favor their dissolution or decomposition. T.] them. After the abscess, (*i. e.*, the separation of the bone,) the first phalanx approximates to the last, and their coaptation renders the action and use of the finger commodious."

With the instruments which the surgeon of the present times has at his command, the operation is neither difficult nor dangerous. If there are wounds or fistulous passages, we enlarge them by dilating the tissues in the direction of the finger. By means of a strong pair of forceps the necrosed fragments are extracted, and with the rasp we destroy the carious portions. If the bone is diseased throughout its whole extent, and there is no convenient opening through the skin, we make an incision upon the dorsal region of the finger, from one extremity of the phalanx to the other. We afterwards detach the tissues in front and posteriorly, with the bistoury; then by means of Liston's pliers, or the articulated, or the eultellaire saw, we make the section in succession of the two extremities of the diseased portion of the phalanx.

A. *Phalanges*.—The finger dressed in the same way as if it were fractured, shortens, during the progress of the cure; but a sort of osteo-fibrous tissue or bridle, ultimately unites the two ends in a solid manner, while the tendons in a greater or less space of time, restore to the ungual phalanx and the other phalanges preserved, a certain degree of mobility. This, at least, is what I have observed to take place in three patients, who had thus lost, one of them the middle phalanx, and the two others the metacarpal phalanx, of one of the fingers. Viguerie, (*Mém. de l'Acad. de Toulouse*, t. III., 1788,) cites two similar cases, in one of which it was the first phalanx, and in the other the second. The same thing took place in the thumb of one of my best friends, and one of the first physicians of France. The first phalanx of his left thumb, diseased for more than a year, in consequence of a wound, ne-

crossed throughout its whole extent and surrounded with a sheath in full suppuration, admitted of being extracted through an ulcerous opening, which required only to be a little enlarged; the finger thus treated, partially recovered its functions. M. Heine, (*Gaz. Méd.*, 1834, p. 644.) also states that he has removed the middle portion of a first phalanx, by means of his osteotome; and M. Sanson, (*Thèse de Concours*, 1833,) has seen the first metacarpal bone reproduced after having been destroyed by necrosis.

B. *Bones of the Metacarpus*.—In treating of amputation of the fingers and of the hand, I have already spoken of some exsections of the bones of the metacarpus, and I shall speak of them again further on. I will add in this place, that if the extent of the evil permits, we ought to exsect only the body of the bone, and do all in our power to save the extremities. Attacked upon the radial side of its dorsal surface, the metacarpal bone of the thumb could be as easily excised with Liston's pliers, or Rambaud's saw, as it could be disarticulated by the method which I have elsewhere spoken of, (vid. supra, under Amputations,) or by that which I shall soon mention. The same could be said of each of the other bones of the metacarpus; all of them might be laid bare separately on their dorsal surface by a long incision, and divided near their head with the instrument I have just mentioned. The tendons pushed to one side or the other during the operation, could be easily avoided, so as to be enabled afterwards to resume their functions.

Besides that this operation, which was already recommended by M. Champion, in 1815, is more easy and infinitely less serious than disarticulation, it would have also the advantage, the osseous epiphyses being preserved, of rendering the re-establishment of an osteo-form cicatrix less difficult, and of presenting many more chances of retaining the form and primitive functions of the corresponding finger. It would be an easy matter for me, were I disposed to analyse the cases where amputation of the bones of the metacarpus with disarticulation of one or both their two extremities has been performed, whether the finger corresponding has been preserved or carried away at the same stroke, to show that it would have been possible in many of these cases to have restricted ourselves to the simple excision of the part diseased.

## § II. *The Fore-arm.*

When the body of the bones of the fore-arm is carious, or necrosed or degenerated, it may seem impossible to cure the disease without amputation. I have to reproach myself with having amputated the arm of a man, whose fore-arm swollen and perforated with fistulous passages for many years, had nevertheless, for its fundamental lesion, no other than fragments of necrosed bone, which were completely isolated in the centre of the ulna, and which it might have been possible to have removed by exsection. The same thing happened to me with a scirrhus affection which was situated in the body of the radius, and which at the present day probably I would have destroyed, while preserving to the patient his hand.

A. *Ulna*.—Seultetus, (*Arsenal de Chir.*, tabl. 28, p. 83,) in order to remove an invaginated necrosis of the ulna, made an incision from



the carpus to the elbow, and Pezoldi, (*Obs. Med.-Chir.*, p. 126,) relates that Fr. C. D'Armbruste, had successfully extracted twenty portions of this bone from a student affected with spina ventosa. In a case of caries, Roland, (*Bonet*, t. IV., p. 116,) succeeded by rasping the bone daily; and M. Baudens, (*Gaz. Méd.*, 1838, p. 415,) in a case of gunshot wound has removed four inches of this bone. It appears also, that the middle portion of the ulna had already been exsected, during the last century by a surgeon who was an acquaintance of Orred, (*Bull. des Sc. Méd. de Bologne; Journ. des Connaiss. Méd.*, 1834, t. II., p. 201.) A soldier who had lost a considerable portion of the ulna, and whose case was mentioned by Dupuytren to M. Champion, (*Thèse* No. 11, Paris, 1815, p. 57,) was not maimed by it; and the exsection of this bone appears also to have been performed by M. Withusen, (*Jæger, Op. cit.*, p. 20,) and by M. Werr, (communicated by M. Sprengler, in 1838.)

Three conditions may be presented here, as in almost all the long bones; sometimes the disease is situated upon the surface of the bone, and does not include its entire thickness; sometimes a sequestrum has been formed in the centre of a new bone, as if in a sheath or long cavern; finally it may happen that the bone is diseased throughout the whole thickness of its cylinder.

In the first case, we incise all the soft parts upon the superficial surface of the bone, above and below, and to an extent which goes an inch beyond the limits of the disease. After having properly isolated the part to be cut out, we make use of the crested saw, or that in the shape of a mushroom, or with a flat disc, in such manner as to preserve as much of the thickness of the bone as possible, while leaving none of the disease behind. The gouge, mallet, and rasp may also be of service in these cases.

In the second condition, we must also incise extensively. Upon the supposition that ulcers penetrate to the necrosis, and that this latter does not appear to be very extensive, we then limit ourselves to enlarging the opening. Then seizing the fragment with a good pair of scissors, we sometimes succeed in extracting it without any further difficulty. In the contrary case, we are obliged to remove a greater or less portion of the osseous sheath which encases the sequestrum. If this sheath has only one opening, we may enlarge it by means of the concave rowel-saws. If it is confined by a sort of bridge, a cut of the crested saw on each side will enable us to extract the sequestrum afterwards by a stroke of the chisel. We could effect the same object by introducing under it, by means of a flexible and curved probe, the chain-saw of Aitken. Entering by one aperture, and coming out at the other, this saw would thus divide the osseous substance from within outwards, and first on one side and then on the other, with the greatest degree of facility. The chisel and gouge, and even the trephine, might also here be of service. But a strong pair of forceps, and either the crested, rowel, or articulated saw, or the osteotome of M. Heine, would scarcely permit us to feel the want of any other instruments. The canal which encloses the necrosed sequestrum, in such cases, and which is ordinarily very large, when once liberated from the former, contracts and heals without difficulty. But we should err, in attempting to close it by im-

mediate union. It is one of those wounds which must suppurate, which are to be dressed from the bottom, and filled daily with small balls of lint.

I.—*Olecranon*.—I have never had occasion to perform exsection upon the lower extremity of the ulna; but I have seen many patients whose olecranon should have been excised, and might have been so operated upon with advantage, if the patients themselves had consented to it, or the surgeon had decided upon it. I once performed this exsection on a young girl, who recovered perfectly; a necrosis accompanied with caries existed on the projecting point of the elbow; every thing had been made trial of for the space of eighteen months, and several physicians had expressed an opinion that the articulation was involved. Having made a crucial incision upon the soft parts, I laid bare the entire olecranon without any difficulty, taking care to avoid the ulnar nerve behind and the humero-radial articulation in front. Then bending the fore-arm, I was enabled with two cuts of the saw to excise a cuneiform fragment corresponding with the length of the olecranon, and thus to remove the whole of the diseased portion of bone. After the cure, the functions of the limb were performed as perfectly as before the disease. M. Textor (communicated by M. Sprengler) was equally fortunate with a patient upon whom he operated in the year 1836.

#### [EXSECTION ON THE OLECRANON.]

The *Exsection of the Olecranon*, as performed by Dr. G. Buck, at the New-York Hospital, Oct. 29th, 1842, (Vid. *The American Journal of Med. Science*, Philadelphia, April and July, 1843,) for hypertrophy of that process from the effects of a fall, and whereby flexion and extension of the fore-arm were abolished, though pronation and supination remained nearly normal, is reprehended in unqualified terms by M. Guérin (*Gaz. Méd. de Paris*, tome XII., 1845, p. 291,) as an uncalled for, and severe and dangerous operation, especially when the surgeon must have known that ankylosis is the very result we have to apprehend from such attempts, and which result was actually now permanently produced by the ablation in question; *i. e.*, a fixity of position was now given to the arm, when before it had considerable extent of motion, and gave no inconvenience whatever—assuredly a dear-bought compensation, that should have deterred the operator from an experiment of this kind. It is a very different thing where a whole ankylosed, consolidated joint has been exsected, as has been frequently done at the knee.

II. *Body of the Bone*.—When the whole thickness of the bone is to be exsected, the operation becomes a little more serious. If the soft parts themselves are adherent and ulcerated, we must not hesitate to sacrifice some portions of them. The most convenient process here, consists in making two very long and slightly curved incisions, with their concavities facing each other, as in circumscribing an ellipse. The lips of these incisions are then dissected in front and behind as far as the radial border of the bone. The section of the bone may then be effected by means of the chain-saw, if it should be convenient to pass it around the bone by inserting it through the inter-osseal space. If the

chain-saw cannot be used, and the ulna is somewhat voluminous where we wish to divide it, Liston's pliers may be of service. Otherwise we should make use of the vertical saw of M. Léguillou, the flat rowel of M. Martin, or either the erested or hand-saw. The soft parts will have to be carefully protected by compresses or pieces of wood or pasteboard; and we should generally commence on the most movable part of the bone. An elevator, or any resisting metallic plate slipped into the track of the saw, will complete the separation of the fragment we wish to remove, when it should appear to be difficult to effect this by means of the saw.

The excision of the ulna having been accomplished, we must now attend to the dressing with some degree of care. The immovable bandage with a long opening would in a case of this kind be particularly advantageous, since it would allow of the hand being maintained in a suitable position, would prevent the two fragments of excised bone from approximating too near to that which has been preserved, and at the same time enable us to dress the wound conveniently.

B. *The radius*.—What I have just said of the ulna applies equally well to the radius. The carpal extremity of this bone might be excised like the olecranon without obliging us to penetrate into the articulation.

I. Excision of the middle third of the radius has been performed by M. Baudens (*Gaz. Méd.*, 1838, p. 415) in cases of gun-shot wounds. M. Flameng (*Dissert. Inaug.*, &c., Utrecht, Juin, 1834) in Holland has also successfully excised this bone in a state of necrosis. He made use of the chain-saw, which broke twice during the operation; a fibro-cartilaginous tissue ultimately replaced the part of the bone which had been removed. This soldier who was operated upon in 1826 did not die till the year 1832; and the dissection of the limb presented one of the most remarkable cases known. M. Saint-Hilaire (*Thèse*, Montpellier, 1814, p. 16) relates another remarkable example of this operation. The process in other respects is the same as for the extirpation of the radius itself.

II. *Extirpation*.—A necrosis with fungous degeneration of the periosteum which extended nearly throughout the whole length of the forearm, suggested to me in 1826 the idea of removing the radius which was alone affected, in place of amputating the arm; but the patient preferred the latter operation.

In the dead we may perform this operation without any difficulty, and without *absolutely* destroying any tendon or muscle. The forearm is to be placed in semi-flexion. An incision parallel to its axis first lays bare the outer and posterior side of the radius. The two lips of the wound are then held apart and separated by means of the bistoury from its anterior and posterior surfaces, a little below its middle portion, since the radius there lies in some measure naked under the integuments. We then endeavor to insert between its ulnar border and the soft parts a grooved sound,\* which should serve as a conductor to the

\*Wherever a *grooved sound* (*sonde cannelée*) is mentioned in these volumes, it corresponds in function to the instrument which the English and American surgeons term a director. But as the author sometimes speaks specifically of a director or *conducteur*, we have preferred to give the phrase *sonde cannelée*, which appears in almost every one of the operations he describes, a



articulated (or chain) saw. With this last instrument we make the section of the bone, acting from within outwards; we then extirpate the two fragments in succession, dissecting them carefully from their free extremity to their articulation. If there should be too much difficulty in pushing the integuments outwards, or that they should interfere with the introduction of the saw, there would be no impropriety in dividing to the extent of a few lines each of the borders of the first wound.

If an osteo-sarcoma, or any tumefaction whatever should occupy the bone in such manner as not to admit of our sawing at the middle part first, we should begin, after having completed the incision through the soft parts, by disarticulating the upper extremity first, in order to extirpate the bone from above downwards. The rest of the operation is to be conducted upon the same rules as for exsection of the body of the radius. This operation of extirpation of the radius, moreover, has now received the sanction of experience. M. R. Butt (*Anat. Chir.*, American translation, by M. Sterling) of Virginia, performed it with perfect success on living man in 1825.

### § III.—*The Arm.*

Exsections of portions of the humerus external to the articulations of the arm, have frequently been performed. Moreau, (*Champion, Thèse*, &c., p. 53,) in this manner removed the whole continuity of the bone. According to Jæger, (*Op. cit.*, p. 19,) Lecat did the same. These exsections, like those of the fore-arm arc of three kinds. That for invaginated necrosis, is the one that has been performed the most frequently. This necrosis, whether it be situated in the superior extremity or in the middle or inferior portion of the bone, must nevertheless be always attacked upon the outer side of the limb.

At the lower portion we may often remove it without opening into the articulation, or proceeding to amputation. A young peasant, who had his elbow fractured five years before, being exhausted by long continuance of pain, was admitted into the Hospital of La Charité in the beginning of 1838, for a necrosis, complicated with inflammation at the joint. The whole lower extremity of the humerus was greatly enlarged and swollen. I was enabled to ascertain with the probe that the centre of the disease was situated in the interior of the outer condyle. A crucial incision, carried an inch longer above than in the opposite direction, exposed the whole external condyle of the humerus, which I then exsected with the cutting pliers. A fragment of necrosis which was formed there in a boney sheath, was extracted by means of a strong forceps. I then clipped off the margin and inequalities of this cavity, by means of the chisel, a strong scalpel and the cutting pliers mentioned. This young man who had already been severely troubled for six weeks with a wandering erysipelas was attacked with it again fifteen days after the operation, and died at the expiration of two months subsequently, in consequence of the eschars and sub-cutaneous purulent abscesses which appeared throughout every region of the body, and from a diarrhœa which

literal translation. Its meaning is understood, and must not be confounded with the *sound* used in lithotomy, &c. The French call catheters, bougies, directors, &c., all by the general name of *sonde* or *sound*. T.

nothing could check. The wound of the elbow, however, was in progress of cicatrization, and there remained nothing of the disease either in the humerus or arm, [fore-arm,] or about the elbow.

At the middle portion of the humerus the incisions should be made in the same manner as I have described for non-consolidated fractures. At this part I have frequently succeeded by making an incision of only two inches in length, in extracting from the centre of this bone by the aid of a strong dissecting forceps, necrosed portions from two to three inches long, and thus have been enabled in the course of three weeks or a month, to effect cures in patients who had been from eight to ten years the prey to inflammations, abscesses or fistulas.

The operative process will vary here as in exsection of the bones of the fore-arm, and is to be regulated by the same rules.

In its upper third, the humerus affected with necrosis, can only be reached through the deltoid muscle. I have found an advantage in that part cutting out a semilunar flap, with its free border outwards and backwards. Raising up this flap as a kind of covercle, and which contains within it the fistulous passages with which its tissues may be perforated, we are enabled to lay bare with ease all the projecting portion of the bone. Operating in this manner upon a youth whose arm had been diseased for six years, I exsected the bone by means of the saw, carried from above downwards, and parallel to the axis of the arm, first near the root of the flap, and afterwards near the posterior lip of the wound. These two cuts of the saw, which went to join each other at their extremity, circumscribed an operculum which I afterwards detached by means of a chisel. The osseous cavity being thus completely laid open, exposed to view the necrosed cylinder, which was seized hold of, and extracted without difficulty. Having cleansed it of the fungosities and necrosed fragments which remained in it, I had nothing more to do than to allow the semilunar flap of soft parts to fall down upon it, and to treat it with simple dressings. No accident supervened, and the young man got perfectly well.

Enormous portions of the humerus may be in this manner extracted. The arms, in the patient Schmid, (*Journ. de Méd.*, 1686, p. 56—58,) furnish a proof of this; Ruland gives another example, (Bonet, t. IV., p. 140;) and Walker, (*Gaz. Sal.*, 1776, No. 31,) Weidmann. Amvaud, (*Abrégé des Trans.*, trad. de Pinel, p. 324,) Schaack, (Mursinna, *Journ. de Chir.*, t. I., p. 195,) Middleton, (*Trans. Philosoph.*, abrégé par Pinel, p. 321,) M. Champion and Simonin (communicated by M. Champion,) relate analogous cases. To the remarkable examples of this kind which are given in the *Memoires de l'Académie*, and to those which occurred in the practice of Dupuytren, and which I myself saw at the Hôtel Dieu, may be added the following: A young vine-dresser, aged fifteen years, had in consequence of measles a necrosis in the humerus, for which nothing was done for the space of near two years. M. Anthème, a surgeon of Tours, seizing the necrosed fragment with an ordinary forceps, extracted it, and found that it comprised the whole upper and middle third of the humerus. Notwithstanding this enormous loss of substance, the arm gradually re-acquired its original strength, and enabled the young man to occupy himself without any inconvenience with the laborious occupations of husbandry, (*Société Méd. de Tours*, 1817, 2e trim., p. 14.)

§ IV.—*The Clavicle.*

The body of the clavicle, which is frequently affected with exostosis, caries, and syphilitic necrosis, is also very liable to critical and scorbutic necrosis, as in the case of Angerville, (Chopart, *De Necrosi Ossium*, 1776,) and also to sarcomatous degenerescence. Its relations with the chest and especially with the subclavian vessels, and the little opportunity it offers for instruments, had at first placed it altogether out of the pale of surgical operations. Even supposing that the idea of removing the middle portion of the clavicle had suggested itself to the minds of surgeons, it would have been soon also renounced from the fear of destroying at the same time the functions of the arm. At the present day these apprehensions have been put to rest. Kulm (*Thèse de Waller*, trad. Franç.) had already mentioned the case of a man in whom exsection was performed upon the clavicle for an osteo-sarcoma, weighing five pounds, and which patient got perfectly well without losing the use of his arm. Meyer (Rougemont, *Bibl. Chir. du Nord*, t. I.) relates the case of a young person in whom the whole continuity of the clavicle in a state of necrosis was extracted without leaving any infirmity. The same thing occurred in the patient of Otto, (*Gaz. de Méd. Nation. pour l'Allem.*, 1778, No. 46,) and more strikingly still in the one mentioned by Pezoldi, (*Obs. Méd. Chir.*, p. 126, 1715.) The case of a child is also given who in consequence of small-pox lost one of its clavicles *entire*, without however impairing any of the functions of the corresponding arm [!]. The case given of M. Gilgenerantes (*Journ. des Progrès*, t. III., p. 240) in which he extracted more than three inches of the clavicle; the facts mentioned by M. Coulon, (*Thèse citée*, 1833, p. 29;) the operations performed by MM. Mott, Warren, (communicated by the author,) and Travers, of which I shall speak farther on, have moreover shown that the clavicle may be exsected or even extirpated in its totality with success.

*Operative Process.*—Whether the disease be a necrosis or an osteo-sarcoma, the body of the clavicle should be attacked always upon its antero-superior region. Where there is necrosis there will necessarily be some ulcers and fistulas. After having divided the integuments which separate these passages, or enlarged the only one that exists, we shall be enabled to ascertain if it will be advisable to treat the perforations in the new bone in the same way, [*i. e.*, by dilating them—see above. T.]; if the openings in this latter are not arranged in such manner as to admit of the issue of the diseased fragments, we proceed to the employment of the crested or rowel saw, and a strong scalpel, and the gouge and mallet, in the manner I have already described in speaking of exsections of the humerus. The species of table which constitutes the anterior portion of the bone, may in this manner be exsected entire, when any necrosed parts whatever that exist may be then readily extracted. Upon the supposition, however, that the sequestrum reached to a great extent towards the acromion or sternum, we might then be placed under the necessity of breaking it in order afterwards to extract the two portions successively.

This kind of exsection is not difficult, nor is it very dangerous; the continuity of the bone moreover remains intact, and the portion left upon



the postero-inferior region, always suffices for the reconstruction of the whole. When on the contrary the disease is of a cancerous character, and it becomes necessary to exsect the whole thickness of the clavicle, the *operation becomes exceedingly delicate and dangerous*. [We give the author's own words, because ignorant or envious persons, who generally presume the most, have in some places endeavored to decry this operation as trivial—seeing that they do not come in for a share of the honors. The author, it will be perceived, forcibly portrays the danger of these exsections. T.] It is in this operation where there is no moment at which each stroke of the bistoury may not incur the risk of admitting air into the veins; where no tissue can be divided without exposing to the danger of wounding enormous veins or voluminous arteries; it is here also that suppuration may be effused into the chest with the greatest degree of facility, leading to consequences which may prove speedily mortal; therefore in this operation we must circumscribe an ellipse of greater or less breadth upon the integuments and in front of the tumor, taking care to prolong the angles of this ellipse, very far in the direction of the acromion and sternum. Dissecting afterwards each lip of the wound, the upper one to the neck, and the lower one to near the first rib, we effect the isolation of the bone upon sound parts on its inner as well as outer extremity. This being accomplished, I would recommend that we should with the aid of the bistoury graze the inferior, and then, the superior surface of the bone on the outer side of the tumor, in order to introduce the chain saw and to effect the section in that part before proceeding any farther. The same thing should be done on the sternal side, if the thickness of the tissues should not render the coming down upon the clavicle in this direction a matter of too great difficulty. Then grasping the tumor itself in order to raise it up while drawing it towards us, we should dissect carefully from below upwards, and from before backwards, or from without inwards, never losing sight of the neighborhood of the subclavian vein and even that of the internal jugular. As the operation may be long, it will be necessary to tie in succession all the arteries.

The removal of the tumor being effected, I would fill up the bottom of the wound with small balls of lint, after which I should bring the borders of the wound slightly together, and not place them definitively into actual contact until after the expiration of eight or ten days.

No. III.—*June 17th, 1828.—An account of a case of OSTEO-SARCOMA OF THE LEFT CLAVICLE,—in which Exsection of that Bone was successfully Performed,—*BY VALENTINE MOTT, M. D. (*See American Journal of the Medical Sciences, Philadelphia, 1828, Vol. III. p. 100–108.*)

On a former occasion, the author of the following paper laid down the principles which ought to govern a surgeon in relation to operations generally, and gave, in illustration, an account of a successful amputation at the hip-joint, (See *supra*, this vol.; also *Phil. Med. and Phys. Jour.* Vol. XIV. p. 101.) Since then, he has enjoyed the satisfaction of seeing the same views beautifully illustrated by Dr. Barton's excellent operation for the production of an artificial joint, (*Ib.* p. 177,) and has himself presented a further illustration in the successful ligature of the

common iliac artery, (See, *supra*, this vol. ; also *Jour. of Med. Sc. Vol. 1st*, p. 156.) The instance now to be adduced, is of a character to supply all the confirmation desirable to the establishment of any such principle ; and we think it may henceforward be regarded as an axiom that it is the duty of a surgeon to operate *in every case* which allows of a rational hope of success, either of improving the patient's condition, or of preserving his life. It is almost superfluous to add, that in arriving at this conclusion, we do not believe it proper for every man who is *nominal*ly of the profession to assume such high responsibilities ; but, that we regard those as surgeons and those alone, who have, by conscientious devotion to the study of our science, and the daily habitual discharge of its multifarious duties, acquired that knowledge which renders the mind of the practitioner serene, his judgment sound, and hand skilful ; while it holds out to the patient rational hopes of amended health and prolonged life.

William B. Yates, of Charleston, S. C., aged nineteen years, of a plethoric habit, consulted me on the 26th of May last, respecting a tumor situated on the left clavicle.

He stated, that on or about the 1st of February, 1828, he discovered a small tumor, as large as a pigeon's egg, very hard and immovable, in the left clavicle ; no pain whatever attended it, and the skin was of its natural color. He can assign no cause to which it could be attributed ; he had always enjoyed good health ; he recollects, however, having sprained his arm a short time before he first observed the tumor, but does not ascribe it to that, as it might have existed previous to the accident, and unknown to him. He applied immediately to a physician, who pronounced it an encysted tumor, and applied warm salt-water ; which, not producing any good effect, blisters, poultices, a seton, and escharotics, were resorted to, but without retarding in the least its growth. These remedies debilitated him so much, as to prevent him from taking ordinary exercise. But during his passage to New York, he regained his, in some degree, former energy, and has since enjoyed pretty good health.

On examination, a conical tumor, about four inches in diameter at its base, and of an incompressible hardness, was found on the anterior portion of the clavicle, to which it was firmly attached ; the apex of the tumor was covered with luxuriant fungous granulations, the consequence of the above applications, from which profuse bleedings from time to time took place.

The rapid increase of the disease led him to request that some operation should be performed, preferring to submit to a new and uncertain operation, rather than perish with the terrible disease that now threatened his existence. All the circumstances were candidly stated to him, both by Dr. Barrow, who was associated with me in the case, and myself—that the operation was without a precedent—that it was impossible for me to say the disease could be eradicated—if it could, it would be exceedingly difficult and dangerous—that the operation would be very complicated, as the parts connected with it were of the greatest importance to life, and involved the most important structure. Nevertheless he was perfectly resigned, and resolved to submit to a doubtful remedy. With a composure and fortitude which has rarely been equalled within my observation, he said he had resolved to take the chance of the operation, and disregarded the pain and suffering to which he must be subjected.

On the 17th of June, between eleven and twelve o'clock, A. M., he was placed upon a table, with his shoulders a little elevated, inclining to the left side. Assisted by Dr. Barrow, Dr. Proudfoot, and Dr. A. E. Hosack, in the presence of Drs. Hull, Storer, Leveridge, Pratt, and a number of my pupils, the following operation was performed:—

An incision was commenced over the articulation of the clavicle, with the sternum, and carried in a semicircular direction, as close to the fungous projections as the sound integuments would admit of, until it terminated on the top of the shoulder, near the junction of the clavicle, with the acromion process of the scapula. This incision exposed the fibres of the pectoralis major, which was divided as near the tumor as possible; in accomplishing this, as well as the first incision, arteries sprung in every direction, and required ligatures. A number of large branches of veins, under this muscle, emitted blood freely, and required to be tied.

In conducting the incision through the pectoral muscle, towards the scapular extremity of the clavicle, care was taken to avoid the cephalic vein, as it passes between this and the deltoid muscle. A small portion of the latter muscle was detached from the clavicle, which readily allowed the vein to be drawn outward towards the shoulder.

On attempting to pass the forefinger under the vein and deltoid to the lower edge of the clavicle, it was found impracticable, as the hard osseous part of the tumor extended beyond this point, and was completely in contact with the coracoid process of the scapula.

Finding it impossible, from the size of the tumor and its proximity to the coracoid process, to get under the clavicle in this direction, an incision was made from the outer edge of the external jugular vein, over the tumor, to the top of the shoulder. After dividing the skin, platysma myoides, and a portion of the trapezius muscle, a sound part of the clavicle was laid bare at a point nearer the acromion than a line with the coracoid process; a steel director, very much curved, was now cautiously passed under the bone from above; which, from the firm bony state of the tumor at this part, had a considerable obliquity outwards. Great care was taken to keep the instrument in close contact with the under surface of the bone. The depth of the bone from the surface, rendered it somewhat difficult to accomplish this safely: an eyed-probe, similarly curved, conveyed along the groove of the director a chain-saw, which, when moved a little, showed that nothing intervened between it and the bone; the clavicle was then readily sawed through.

The dissection was now continued along the under surface of the tumor, below the pectoralis major; here a number of very large arteries and veins required tying. The first rib being next exposed under the sternal extremity of the clavicle, the costo-clavicular or rhomboid ligament was divided, and the joint opened from the lower part. This gave considerable mobility to the diseased mass, and encouraged us to believe that its complete removal would be practicable.

By means of a double hook and elevator, with the assistance of our strong and very broad spatulas, properly curved, we were enabled to elevate a little the sawed end of the clavicle. After loosening the parts about it, by keeping close to the tumor, we wished to discover the subclavius muscle, as it is inserted in the bone about this situation; but



it could not be seen, as it was incorporated with the diseased mass. Had this muscle been found, the separation of the tumor would have been much less difficult and tedious, as, by keeping above it, the subclavian vein is of course protected. The origin of this muscle, from the cartilage of the first rib, was seen and divided, but it was almost immediately obliterated in the tumor.

Continuing the removal of the tumor at the upper and outer part, the omo-hyoides was found lying under it, which we exposed from where it passes under the mastoid muscle, to near its origin from the superior costa of the scapula. In separating the tumor from the cellular and fatty structure, between the omo-hyoid muscle and the subclavian vessels, a number of large arteries were divided, which bled freely, and particularly a large branch from the inferior thyroidal.

The anterior part of the upper incision was now made from the sternal end of the clavicle, and carried over the tumor, until it met the other at the external jugular vein. After cutting through the platysma myoides, this vein was carefully separated from the surrounding parts, and two fine ligatures passed beneath it, and tied a short distance from each other; the vein was then cut between the ligatures.

The clavicular part of the sterno-cleido-mastoideus was next divided, about three inches above the clavicle in the direction of this incision. The deep-seated fascia of the neck being now exposed, the mastoid muscle, and the diseased mass, were very cautiously separated from it, until the anterior scalenus was exposed.

The subclavian vein, from the edge of the scalenus anticus to the coracoid process, was so firmly adherent to the tumor, as to lead me at one moment to believe that the coats of the vein were so intimately involved in the diseased structure, as to render the complete removal of the morbid part utterly impracticable. By the most cautious proceeding, however, alternately with the handle and blade of the knife, we finally succeeded in detaching the tumor, without the least injury to the vein. This part of the operation was attended with peculiar danger and difficulty. At every cut, either an artery or vein would spring, and deluge the parts until secured by ligatures. Besides several large veins, the external jugular was so situated in the midst of the bony mass, as to require two more ligatures in this place, near to the subclavian, and it was again divided in the interspace. Near the sternal end of the clavicle, a large artery and vein required tying; they were considered as branches of the inferior thyroidal artery and vein.

From having cut through the clavicular portion of the mastoideus muscle, obliquely upwards and outwards a little above the tumor, we were enabled, by turning this down and keeping close to the fascia profunda, to detach the tumor from over the situation of the thoracic duct and junction of the internal jugular and left subclavian, without the least injury to these important parts.

To reach the lower part of the tumor as it extended upon the thorax, it was necessary to separate the pectoralis major in a line with the fourth rib, and to make a transverse incision two inches in length through the integuments and muscles at about its centre. The incision upon the neck extended from the sterno-clavicular junction in a semi-circular direction, to within an inch of the thyroid cartilage and base of

the lower jaw, and two inches from the lobe of the ear, and terminated near the junction of the clavicle and scapula.

The fungous and bleeding character of the apex of the tumor implied that it was freely supplied with vessels. The discharge of blood was so free at every step of the operation, that about forty ligatures were applied. It was estimated that the patient lost from sixteen to twenty ounces of blood.

All the parts now presenting a healthy appearance, the ligatures were cut close to the knots, and the cavity of the wound filled with lint. Long strips of adhesive plaster were applied, to prevent the edges of this extensive wound from further retracting; a light compress, a single-headed roller loosely applied around the chest and shoulders, completed the dressing.

He was placed in bed upon his back, inclining a little to the right side, with the head considerably elevated, whilst the left shoulder and arm were supported by a pillow.

I requested two of my promising pupils, Messrs. Thomas G. Swain of New York, and John W. Schmidt of Charleston, S. C., to remain with him during the day and following night; and such was the interest which his ease excited in their minds, that they remained in the room with him night and day for the first week. To their unwearied attentions I am indebted for the following report of his symptoms:—

*June 17th*, 1828, 7 o'clock, P. M. Feels comfortable, except being nauseated by the wine and water given him during the operation, which he says generally produces this effect upon him. Some reaction is indicated. Between 7 and 8, P. M., took two cups of gruel, and has since vomited a little. 9 P. M. Pulse 110; skin moist and cool. He feels tolerably comfortable, and is much gratified that the operation has been performed. Took a little mint tea, which was grateful to him. 12 P. M. Has had a short repose; drank some mint tea, and feels quite comfortable; pulse 128; thirst considerable.

*June 18th*, 3 A. M. Has had a comfortable sleep, during which there was considerable hemorrhage from the wound; pulse 120, hard and full. 8 A. M. Took a cup of tea, ate a piece of toast, with a few strawberries; feels better than previous to the operation; pulse 124. 12 P. M. Has slept during two hours, and is now in a comfortable sleep; pulse 130; skin moist and warm.

*June 19th*, 4 A. M. Feels much refreshed; administered the following:—R., Sulph. magnes.  $\mathfrak{zss}$ .—calc. magnes.  $\mathfrak{zj}$ . M. dissolved in a small quantity of water. 10 A. M. Another cathartic directed, which produced an evacuation at 2 P. M., and afforded much relief. 9 P. M. Has taken toast and tea, and has a good appetite; pulse 124, and much softer; copious discharge from the bowels; febrile symptoms less.

*June 20th*, 3 A. M. Skin moist and cool; appetite good; pulse 120. 9 P. M. Pulse 106; bowels free; feels comfortable.

*June 21st*, 2 A. M. Thirst much abated; skin moist and cool; has slept well. 9 A. M. The bandage and part of lint removed, it being a little fetid; inflammation moderate, and accompanied with a slight suppuration; bowels being somewhat torpid, the following medicine was prescribed:—R., Pulv. rhei.—mag. calc.  $\mathfrak{aa}$   $\mathfrak{ziss}$ .—sacch. alb.  $\mathfrak{zj}$ .—aqua menth. pip.  $\mathfrak{z}$   $\mathfrak{iiij}$ .—took two table-spoonfuls every hour, which operated at half-past one copiously.

*June 22d*, 9 A. M. Has had small evacuations from the bowels; slept well and comfortably; pulse 108; the dressings were removed except a small pledget of lint at the bottom of the wound, over which an emollient poultice was applied.

*June 23d*, 9 A. M. Has slept comfortably; pulse 109, soft and full; skin natural. Ordered the following cathartic:—R., Sulph. magnes.  $\frac{3}{4}$  ss.—magnes. calc.  $\frac{3}{4}$  j.—which was repeated in the afternoon.

9 P. M. Medicine has operated copiously; pulse 99, softer and more natural; skin pleasant; tongue clean; renewed the poultice.

*June 24th*, 9 A. M. Symptoms the same; bowels have been opened; removed some of the remaining lint; applied a fresh poultice; removed him to another bed, for the purpose of airing his; no inconvenience from the removal; takes toast and tea, gruel, &c., through the course of the day.

*June 25th*, 9 A. M. Pulse 98; tongue clean; bowels torpid. Ordered a Seidlitz powder every hour till it operated; he took seven.

*June 26th*, 9 A. M. Pulse 95; slept well during the night; patient expressed a desire to eat; gave him some chicken broth, which was very palatable.

*June 27th*, 9 A. M. Pulse 84; at 10 o'clock administered an enema, which produced copious evacuations.

*June 28th*, 9 A. M. Took some strawberries, toast and tea; takes  $\frac{3}{4}$  viij. of the infusion of cinchona through the day.

*June 29th*, 9 A. M. Pulse soft and full; bowels torpid. 9 P. M. An enema administered, which produced copious evacuations.

*June 30th*, 9 A. M. Pulse 95, full and hard; the wound is dressed every morning; it is now nearly half filled with healthy granulations. The skin much contracted; some ligatures have been removed, others quite loose. He requires an enema every other evening, to keep his bowels open.

*July 1st*. Pulse 100; injection produced copious evacuations of a natural appearance.

*July 2d*. Permitted him to eat meat; pulse natural; wound continues to fill up rapidly with healthy granulations; continues to take the cinchona  $\frac{3}{4}$  viij. per diem.

*July 3d*. Feels in every respect much better; pulse natural; skin moist; experienced a slight indisposition from a cold produced by a sudden change in the weather. Directed him a dose of the eceoprotic mixture.

*July 4th*. Wound has a healthy appearance; cicatrization has commenced; seven ligatures were removed; dressed it with lint, over which a compress was applied.

*July 5th*. Sets up in bed with ease; two ligatures removed.

*July 6th*. An apparatus applied yesterday to support the arm. No unfavorable symptoms have appeared.

*July 7th*. A number of ligatures were removed to-day.

*July 8th*. Bowels require no more injections at present. Wound nearly filled, and is very florid and healthy in its appearance.

*July 9th*. The cut end of the remaining portion of the clavicle is perfectly sound and healthy.

*July 10th*. Continues to improve in strength; bowels still regular skin pleasant; tongue clean; pulse natural.



*July 11th.* The slight catarrh, complained of a few days since, has entirely left him.

*July 13th.* The end of clavicle entirely covered with healthy granulations.

*July 14th.* The ligatures remaining are very few; wound contracted astonishingly; nearly filled with very florid and healthy granulations. Walked down stairs to dinner yesterday and to-day without the slightest inconvenience.

*July 15th.* The patient goes about the house with his arm in a sling and the apparatus to support the shoulder.

*July 16th.* No more ligatures remaining; the granulations rising above one part of the integuments, require pressure. Continues the infusion of bark.

He continued to improve in general health, and the wound gradually filled up, until the middle of August, when he left the city on an excursion of pleasure to the Springs at Saratoga. He returned in September, in better health than he had ever enjoyed.

The tumor is about the size of a man's doubled fists, or of a circumference just to allow me to grasp it with my fingers fully extended. It consists of a boney cup, incompressibly hard at all parts, except superiorly and inferiorly to a small extent. From an opening of an elliptical shape at the upper part, protruded a bleeding fungus, of the size and shape of half a hen's egg. At the under surface, as it lay upon the great subclavian vessels, the boney character is less manifest; the structure about the centre particularly appearing to be cartilaginous or semi-osseous. This boney enlargement occupies the clavicle from the sternal articulation to within half an inch perhaps of the acromial extremity. From the motion which can be given to each end of the clavicle, the natural structure of the bone seems to be entirely destroyed.

This operation far surpassed in tediousness, difficulty, and danger, any thing which I have ever witnessed or performed. It is impossible for any description which we are capable of giving, to convey an accurate idea of its formidable nature. The attachment of the morbid mass to the important structure of the neck and shoulder of *the left side*, and to so great an extent, is sufficient to indicate its magnitude and difficulty.

The extensive nature of this operation, led us to take the precaution of securing the external jugular with a double ligature, and dividing it between them. Though in operating upon the neck we have several times cut these veins without any unpleasant consequences, we however think we have witnessed almost fatal effects from the division of a large vein, and the admission of air into the circulation.

The case of Baron Dupuytren's in which a young woman suddenly died under an operation, from the division of a large vein in the neck, whilst he was engaged in removing a tumor, contributed, with my own experience, to make me take the precaution of previously tying the vein in this operation.

In an attempt which I made to remove the parotid gland in an enlarged and seirrhous state, the facial vein, where it passes over the base of the lower jaw, was opened in dissecting the integuments from the tumor, in the early stage of the operation, before a single artery was

tied. At the instant this vessel was opened, the attention of all present was arrested by the gurgling noise of air passing into some small opening. The breathing of the patient immediately became difficult and laborious, the heart beat violently and irregularly, his features were distorted, and convulsions of the whole body soon followed, to so great an extent as to make it impossible to keep him on the table. He lay upon the floor in this condition for near half an hour, as all supposed in *articulo mortis*. As the convulsions gradually left him, his mouth was permanently distorted, and complete hemiplegia was found to have ensued. An hour and more elapsed before he could articulate, and it was nearly a whole day before he recovered the use of his arm and leg. From a belief that these effects arose from the admission of air into the blood-vessels, which was not doubted by any person present, I instantly called to mind a set of experiments, which I made some twenty years since upon dogs, by blowing air into the circulation, by inserting a blow-pipe into a large superficial vein upon the thigh, and was forcibly struck with the similarity of result.

To the extraordinary composure of mind which our patient manifested, is to be attributed in a great measure his undisturbed and speedy recovery. No adverse symptoms, of a general or local nature, took place to interrupt the process of granulation in the wound. The immense chasm which was left, and such important parts as have been described, being only covered with lint, necessarily occasioned me great solicitude, until I saw suppuration fully established, and the great vessels covered by granulations.

No difficulty attended keeping his shoulder in a proper position, by the use of the common apparatus for fractured clavicle. With this he walked about without any inconvenience, after four weeks had elapsed; and two months from the time of the operation, he was able to discontinue the sling, and by means of an apparatus contrived by Mr. James Kent, a most ingenious and inventive artist, to supply the want of clavicle, he was so fitted as to have his shoulder in its proper position, at the same time that the full motion of his arm was preserved.

*Professor Mott's case of Exsection of the Clavicle.* (Extract of a letter from Dr. A. F. Vaché, of New York, to Dr. Hays. See *Phila. Amer. Jour. of the Med. Sc.*, vol. VII., p. 271, year 1830.) You express a desire for a continuation of the case of exsection of the clavicle, or rather for a report of its result. It gives me much pleasure to state its successful termination, and the perfect health of the gentleman upon whom it was performed. About two months ago, while on an excursion of pleasure to New York, he called at Dr. Mott's, and I examined his shoulder. He remarked that he continued to wear the mechanical contrivance until the anniversary of the performance of the operation, when he laid it aside, not finding it any longer necessary. On examination, I found that the small acromial portion of the clavicle, which had not been removed by the operation, had formed permanent adhesions with the surrounding parts, and maintained the shoulder in its natural position. He had perfect use of the arm in all its motions, and the cicatrix was all that appeared to indicate any operation ever having been performed.

## [EXSECTION OF THE CLAVICLE.

Mr. Liston, of London, (See his *Surgical Lectures—London Lancet*, Dec. 21, 1844, p. 361,) would appear to make rather light of the idea of any thing very formidable being attached to the exsection even of the entire clavicle. It is to be noted, however, that Dr. Mott, in his lectures teaches, and has ever taught, that this operation, which is another of those in surgery first performed by him, that he deems it, so far as the manual is concerned, one of the most dangerous and difficult, if not *the most so*, of any to which the human body has ever been subjected, not excepting that of the ligature upon the arteria innominata; an unwavering adherence to which opinion, deliberately formed, Dr. Mott would, with all due deference to the judgment of others, take occasion to reiterate in this work.

It is unnecessary to recapitulate what is familiar to all, the extent of vital parts immediately interested with or actually attached, it may be said, to this bone throughout its whole length.

What facilities Mr. Liston may derive from a species of screw-lever to be inserted into the bone after disarticulating or making the section of one extremity, to hold up the diseased mass, Dr. Mott never having used it, cannot say; but no doubt it may be serviceable, as well as the *small copper* spatulas to hold the parts well asunder while dissecting the bone, and which Mr. Liston says he has found immensely useful.

But nothing, as it appears to us, can justify (if his lectures be correctly reported,) the *degagée* manner in which he speaks of this operation when he says, (*Ib.*, *Loc. cit.*, p. 361.) “It (*i. e.* the operation of removing the clavicle for what he calls fibro-cartilaginous tumors,) is attended *with some little difficulty*; there are very important parts under it; but by dissecting close upon the bone and tumor, you *avoid the nerves and vessels*”!

We trust no young surgeon will be induced by the *cheapness* which the London professor's language would seem to attach to this operation, and which to him perhaps may not be formidable, to undertake haphazard or thoughtlessly to carry his knife into such a region without some little surgical experience and anatomical knowledge at least, though aided by ever so powerful an array of adjunct mechanical implements.

Mr. Liston considers that in osteo-sarcomatous and *soft* tumors of the clavicle, especially if the glands are affected in the latter, the exsection of the bone is not to be meddled with. In fibro-cartilaginous tumors he would remove it, and has removed it as he informs us. [T.]

§ V.—*The scapula.*

The scapula may, like the clavicle, be affected with necrosis and sarcomatous degenerescence; but it is surrounded by such thick muscles that its exsection would seem at first to be a difficult matter. Certain facts, however, prove that this operation is not impossible. M. Janson, for example, effected the removal of a great portion of the scapula without touching either the shoulder or the chest; so also did M. Luke. It is also said that Jæger (*Coulomb, Op. cit.*, p. 29—30,) who himself



ascribes operations of this kind to MM. Liston, Haymann and Syme, (Jæger, *Opérat. Résect.*, etc., p. 16,) has successfully exsected the spine and almost the entire body of the scapula, in a young girl, upon whom M. Textor had previously performed amputation of the arm.

A. *Exsection* here also presents a number of modifications: we may have to remove only one of the angles or the spine of the scapula, or it may become necessary to exsect the greater portion of this bone. To cut down upon the inferior angle, as Sommeiller did it, in 1796, (Champion, *Thèse*, etc., p. 47,) the better plan would be to incise liberally through the corresponding region of the integuments and latissimus dorsi muscle. Being properly denuded, the bone could then be readily excised with the common, or crested or chain saw, or M. Liston's cutting pliers.

B. The *superior angle* would also require a transverse incision, which would involve a portion of the trapezius and levator anguli scapulae muscles; the same instruments would also be required for the section of the bone. As to the *spine itself* of the scapula, the inner half of which was exsected by M. Champion, we should in order to cut down to it, begin with an incision which should follow the entire length of the spine and enable us to isolate the supra-spinatus muscle above, and the infra-spinatus below. M. Liston's cutting pliers, or the ordinary cutting forceps, or the concave rowel saw, would then be more suitable than any other instruments.

C. If the *body* of the scapula should be diseased as in the case of M. Jæger, or that of M. Castara (Com. by the author, Dec. 1838,) we should obtain some facility in exsecting it, in laying it bare by means of three principal incisions, one over the whole length of the spine, and the two others setting out from the anterior extremity of this prominence, to be prolonged to the root of the neck in one direction, and to the hollow of the axilla in the other. The soft parts which cover the supra-spinatus and infra-spinatus fossæ, should afterwards be turned back above and below, under the form of a triangular flap for each. After having sawed through the root of the acromion, and detached the whole circumference anteriorly and posteriorly, and then reversed from within outwards the body of the scapula, we could in turn, make the exsection of this latter near the glenoid cavity, either by means of the chain-saw glided underneath, or by the small hand-saw. We should in such a case be obliged to divide the common scapular and supra-scapular arteries. The sac formed by the wound would be easily diminished by the approximation of the flaps, but we ought not to attempt the complete closure of the wound until after the expiration of eight or ten days.

#### § VI.—*Exsection of the Scapula.*

The operation of exsection of the body of the scapula, also, would vary still more than that for the clavicle.

M. Janson, (*Arch. Gén. de Méd.*, t. XII., p. 414,) who has performed it, commenced by circumscribing the tumor by means of two semi-elliptical incisions, while preserving as much of the skin as possible; he then dissected and reversed upon their external surface the two lips of the wound; and detached the morbid mass in every direction down

to the fossa sub-scapularis ; but while he was raising it up in order to bring it forwards, it broke at its middle, and compelled him to separate at first only its outer half. After having divided the attachments of the trapezius, supra-spinatus and infra-spinatus muscles, the operator, discovering that the portion of the scapula situated above its spine was sound, separated, by means of the saw, the whole of the diseased bone, and thus preserved the articulation of the arm. By means of a last incision directed obliquely from below upwards, from behind forwards, and from without inwards, he laid bare the rest of the tumor ; dissected it with care ; drew it cautiously upwards ; felt the cellular tissue which had attached it to the arm giving way, and finally detached the mass completely. All the vessels were tied. The bottom of the axilla was tamponed, and the lips of the wound, which was six inches in its transverse diameter and nine inches from above downwards, were brought together by means of adhesive plasters. The motions of the arm upon the glenoid cavity were preserved. The tumor weighed eight pounds and a half, was easily torn, and in its interior resembled a pomegranate.

Faure, (*Mém. de l'Acad. de Chir.*, t. VI., p. 114,) after amputating the arm, excised the acromion on account of some irregular asperities upon it, and Frater, (*S. Cooper, Dict. Chir.*, t. I., p. 92, col. 1, also advises this operation, which is disapproved of by M. S. Cooper, (*Ibid.*) Laisne, (*Journ. Gén. de Méd.*, t. VIII., p. 401,) removed in this manner a sequestrum from the glenoid angle, on the seventy-first day after the wound. In a case mentioned by Despelettes, (*Mém. de l'Acad. de Chir.*, t. II., p. 552, in 4to, et édit. in 12mo, t. VI., p. 247,) and where the shoulder had been carried away by a gun-shot wound, there remained nothing but the anterior angle, yet the patient recovered. In the patient of Halliday, (*S. Cooper, Dict. de Chir.*, t. II., p. 292,) which was seen by M. S. Cooper, though the shoulder was in great part destroyed, and the lung and pericardium exposed, the patient recovered notwithstanding. In the case of Borel, (*Bonet, Corps. de Méd.*, t. IV., p. 84, obs. 49,) the two shoulder-blades had been carried away by a musket-shot. Bond, (*Méd. and Phys. Journal*, Aug., 1821, Vol. LXVI., No. 270,) having seen a suspected case of osteo-sarcoma in the scapula, asks the question, if the patient's life could not have been saved by the removal of the bone ? Mareschal, (*Mem. de l'Acad. de Chir.*, t. II., p. 60, in 4to,) applied the trephine to the scapula, in a case of abscess between that bone and the ribs. A ball was buried in the middle of the infra-spinous fossa ; M. Champion placed the trephine by the side of the ball, and succeeded. Else, (*Sprengel, Hist. de la Méd.*, t. VII., p. 33,) trephined the shoulder in a case of caries. Exsection of the lower angle of the scapula, was performed also by MM. Sommeiller and Champion, (*Champion, Thèse de l'Ecole de Paris*, No. 11, 1815,) which latter, in another case, excised the inner half of the spine of the same bone. Haymann, removed the greater part of the bone for an osteo-sarcoma ; but the disease returned at the end of a year, and ended fatally. In the case of Luke, as well as that of M. Castara, (communicated by the author, Dec. 1, 1838,) the greater part of the shoulder had been invaded by a medullary fungus.

Ravaton (*Chir. d'Armée*, p. 249, obs. 52, 1768) speaks of the two lower thirds of the scapula, together with its acromion and spine, frac-

tured by a gun-shot wound, and which had separated successively. Both in the case of Riolan (*Manuel Anat., et Collect. Acad.*, part. Etrang., p. X.,) and in that of Chopart, (*De Necrosi Ossium*, p. 7, 1776,) a reproduction took place after a sequestrum in the scapula was removed. After a comminuted fracture of the scapula and clavicle, from gun-shot wound, mentioned by Monbalon, (*Gazette Salulaire*, 1764, No. 50, p. 2 col. 2,) it became necessary to extract four fragments of the first-mentioned bone, one of which fragments, and which was of considerable size, belonged to its spine. The fifth and largest fragment could not be taken away until the fifteenth day. Two large pieces of the clavicle had to be removed at a little later period, and the patient recovered.

[In 1837, Professor Reuben D. Mussey, now of Cincinnati, removed both the clavicle and scapula throughout their entire extent. The disease was osteo-sarcoma. The immense wound became consolidated without the formation of a tea-spoonful of pus. In the summer of 1852, Prof. M. heard that his patient was perfectly well. In a letter from this distinguished surgeon dated May 13th, 1854, he informs us that in July, 1845, he removed the arm, entire scapula, and one half of the clavicle, in another patient affected with osteo-sarcoma. He had recently heard from this patient, and he was in perfect health.

In 1838, the late Dr. Geo. McClellan removed the entire scapula and clavicle for osteo-sarcoma. The boy died from a return of the disease in the course of six months.

The following interesting case of excision of the scapula, is reported by Prof. Gross in the *American Journal Med. Science*, April, 1853.

The disease in this case was an osteo-sarcomatous mass, measuring fifteen inches in all directions, implicating the whole of the scapula, growing rapidly, and wearing down the strength of the patient by the pain it occasioned. The patient was a slim and delicate man, aged 40.

"A full dose of chloroform having been administered, an incision, sixteen inches in length, was made from the superior angle of the scapula to the inferior extremity of the tumor, its direction being obliquely downwards and inwards. Another, beginning about five inches below the upper end of the first, and terminating about the same distance from its lower end, was then carried, in a curvilinear direction, so as to include the small oval flap of skin with the tubercle, previously alluded to, in its centre. The integuments, which were exceedingly dense and thick, especially at the superior part of the tumor, were then dissected off from the surface of the morbid growth, first towards the spine, and then towards the axilla. Having detached the elevator and trapezius muscles, I sawed through the acromion process of the scapula just behind the clavicle, and then divided the broad dorsal and anterior serrated muscles. Carrying my fingers next underneath the tumor, and raising it up, I severed its connections with the ribs, cut the deltoid and other muscles of the arm, sawed the neck of the scapula, and thus removed the entire mass with comparatively little difficulty.

Several vessels were divided in the early stage of the operation, at the posterior and middle part of the tumor; but these were easily controlled by the fingers of my assistants. Several arteries near the neck of the bone bled so freely as to demand the ligature after the removal of the morbid growth. About twenty-four ounces of blood were lost.



The patient became very faint towards the close of the operation, and cordials were necessary to revive him. The immense wound thus produced was dressed with three interrupted sutures and adhesive straps, and supported by a compress and a broad body bandage. The patient was placed in bed, and immediately took one grain of morphia. At four o'clock in the afternoon there was a slight oozing of blood from the wound, and the patient complained of the tightness of the dressings, which however, were found to be sufficiently loose. He had taken half a grain more of morphia, had slept somewhat, and was free from pain; the pulse was 76, and of good volume; and there was no nausea, urgent thirst, or restlessness. On the following evening, September 27, the patient having slight traumatic fever, was ordered ten grains of calomel, with one of opium and one of ipecacuanha, to be followed in the morning by castor oil.

No untoward symptoms of any kind occurred after the operation; nearly the whole wound healed by the first intention; and at the end of three weeks, my patient went home with every prospect of a long and prosperous life. In descending the Ohio River, however, which was at that time exceedingly low, and which caused his detention upon the way for nearly a fortnight, he took a severe cold, from the effects of which he never completely recovered. A harrassing cough followed, with symptoms of pleuro-pneumonia, and he died three months after the operation."

Mr. Liston encountered frightful hemorrhage during his operation in 1819, for the removal of a vascular growth situated chiefly below the transverse spine of the scapula. With this he also removed about three-fourths of the bone. In February, 1847, we witnessed the removal of the scapula with about two inches of the clavicle. The operation was performed by that accomplished surgeon Mr. Fergusson, at King's College hospital, London. Full details of this case are given in his *Practical Surgery*, 3d. Lond. Ed. pp. 309, 311, together with an illustration of the parts removed, and of the wound after it was healed. In 1828, Mr. Luke of the London Hospital, removed the scapula involved in a medullary tumor. The hemorrhage was free, some 20 or 30 arteries requiring the ligature. "Eleven months after the operation, the motions of the arm forward and backward were perfect, and in fact, more than ordinary, the limb moving with more than usual pliancy, but yet there was considerable power. She can also perform the actions of rotation outwards and inwards. The elevation of the arm from the side cannot be easily accomplished, and requires the aid of the opposite hand to raise it to a horizontal level. She can lift with ease, moderately heavy substances." (*Lond. Med. Gazette*, vol. V., 1830).

Sometimes in cases of large tumors covering the scapula, it is impossible to decide previous to an operation, whether the bone is or is not involved. Very recently, we prepared to remove the entire scapula, which was completely buried beneath a very hard fibro-cartilaginous tumor, measuring 24 inches in circumference at its base. This, however, was readily detached from the scapula, which was perfectly sound. Lisfranc in his *Precis. de Med. Oper.*, relates a case in which he was perplexed in ascertaining the connections of the tumor, but in which he was at length able to save the bone. G. C. B.]

## CHAPTER II.

## ABDOMINAL EXTREMITIES.

Though it may be difficult at the present day to question the advantages of exsection as applied to the thoracic extremities, it is not altogether the same in respect to the pelvic limbs. Here the artificial limb fulfils almost all the functions of that which has been amputated. In the upper extremities, on the contrary, no apparatus can be so adapted as to render any real service to the patient; [See an exception to this remark in our notes on *artificial arms*, supra. T.] however deformed the rest of the arm may be, in whatever state the hand may be, so long as they are saved, it is always possible to derive advantage from them, in a variety of circumstances. Nevertheless, exsection has been advised and often performed for all the articulations of the lower limb, as well as for those of the upper.

## ARTICLE XIII.—THE PELVIC EXTREMITIES.

§ I.—*The Foot*

Exsection of the body of the bones, is felt to be much less necessary for the foot than for the hand; it is for example useless to think of it for the phalanges of the toes; on the bones of the metatarsus, however, it might be performed with advantage, if their middle portion alone should be affected; also in such cases where at the present day disarticulation would be performed. Having elsewhere stated what has been done for the metacarpal bone of the great toe, I shall not return to that subject at present; I will only add that Heiste, (*Institut. de Chir.*, liv. V., chap. 9,) had already excised its middle portion, and that the four other metatarsal bones could readily be exsected in the same manner. A longitudinal incision either of simple or elliptical form, would enable us to isolate their dorsal surface and two sides in such a manner, as to admit of their exsection at a single stroke first in front, and then behind by means of M. Liston's pliers, or one of the small flat rowel saws of M. Martin, or the osteotome, of M. Heine, though the chain saw would enable us to do it equally well.

As it is next to impossible to exsect the cuboid, scaphoid, or cuneiform bones, without implicating the articulations, I will refer to the article on *Partial Amputations of the Foot*, or the *Exsection of the Joints*, [vid. both supra,] for what relates to exsection of the body of the bones of the tarsus.

[In the Appendix by our author attached to the last edition of this work, he states that in one case he exsected the posterior extremity of the two last metacarpal bones, with the uneiform bone; and in another, the cuneiform bone alone. One of the patients died; the other remained a long time in the hospital. G. C. B.]

§ II.—*Os Calcis.*

There is in the foot, however, a bone which under this point of view,

constitutes an exception ; I mean the os calcis. This bone which is very liable to caries and necrosis, and which makes a projection beyond and in a manner altogether distinct from the others, in the form of a posterior appendage, is as favorably situated for exsection as the long bones. Whether the heel therefore be affected with caries, necrosis, or osteo-sarcomatous degeneration, provided the disease be altogether local, the surgeon ought not to think either of amputation of the leg, nor even of removal of the foot ; exsection of the os calcis alone will be sufficient to cure the patient.

Science possesses numerous and various examples of this. Formey, (*Rivière, Obs. communiquées*, Obs. 3, p. 626, in 8vo.) or Formio (Samuel,) says that a ball existed for seven years in the os calcis where it was deeply embedded, and that he succeeded in extracting it by means of the trephine. In a similar case Morand (*Opusculum de Chirurgie, partie 2*, p. 248,) could not extract the ball, except by embracing it in the circle of the crown of the instrument. Moublet, (*Anc. Journ. de Méd.*, t. XV., p. 548,) having made extensive incisions, in order to lay bare the bone of the heel, removed by means of the chisel every thing which appeared to be rotten, and afterwards applied the actual cautery three times. The cure succeeded to the exfoliation. Hey, (*Practical Observations on Surgery*, p. 37,) removed a considerable portion of this bone without wounding the tendo Achillis : the patient after the cure could walk with the same facility as before. Hey, (*Ibid.*, *Ibid.*) adds that the same treatment had been pursued in many cases admitted into the Hospital of Leeds. This author mentions another fact which ought to be noticed. In a case which he attended, the wound had been stationary for many years. Suspecting that this condition of things depended upon some disease of the bone, though he could perceive no evidence of degeneration in the soft parts, he detached the integuments from the subjacent bone, and removed by means of the chisel a very thin osseous lamina, though this also presented no appearance of degeneration, after which the patient got completely well.

Briot (*Hist. Milit. Chir.*, p. 187, 1818) saw *more than two-thirds* of the os calcis removed in a soldier, who, in order to walk with ease, required nothing afterwards but a high heel to his boot ; and Dupuytren announced, in one of his lectures in 1816, that he had seen the os calcis in an infant reproduced entire. M. Champion (communicated by the Author, 1838) removed from a child, aged eight years, an internal sequestrum from the os calcis, of the size of the little phalanx of the thumb of an adult.

I myself have performed this operation *six times*, without ever having seen it give rise to any serious consequences. In the same way as for the humerus, I lay bare the bone by cutting a large semi-lunar flap from the soft parts, in such a manner that the convex border of this flap is turned towards the front, or behind, or above, or below, according as the disease requires that we should cut down to it in one direction rather than another. This flap being raised up and folded back upon its root, enables us to apply upon the bone either the crested or the small common saw, or the flat or concave rowel saw, the gouge, mallet, sickle-shaped scalpel, or even the actual cautery or trephine. The operation being terminated, the flap naturally falls of itself upon the wound, and



is generally more favorable to regular cicatrization than the crucial incision.

In two patients, who had on the under surface of the os calcis a necrosis the size of a nut, I placed the free border of the flap backwards, and found it easy to remove the entire projecting portion of bone by means of the small common saw, directed from above downwards and from behind forwards. In another case, I deemed it proper to place the border of the flap forwards, and directed the saw from below upwards and from before backwards, because the necrosis was situated immediately under the insertion of the tendo Achillis. In a woman, upon whom I operated at the hospital of La Pitié in 1833, the necrosis occupied the outer side of the os calcis, near its under surface; I raised the flap from below upwards and from within outwards. Being obliged, on the contrary, to destroy a similar disease on the inner border of the os calcis in a child aged six years, upon whom I operated at La Charité in 1838, I turned the convex border of the flap forwards and upwards, in order to be enabled to avoid with certainty the fibro-synovial sheaths which lie behind the internal malleolus. I adopted the same course, in October, 1838, in a patient of M. Barbette, in whom it became necessary to remove the outer half of the right os calcis, which had been a long time carious.

If, however, the whole of the os calcis is to be removed, the crucial incision may be adopted. It is rare, however, that any other than degenerations of a bad character require this kind of exsection; the necrosis presenting itself almost always under the form of a fragment or nodule, imprisoned, in the centre of a fistulous cavity, requires only that we should make an opening of sufficient size to extract it, and thus place the system in a situation to dry up the purulent discharge. The excision of the os calcis, which has been performed at Wurtzburg by M. Heine, (*Gaz. Méd.*, 1834, *Memoire citée*, p. 644;) at Paris by M. Roux (*Lancette Franc.*, t. II., p. 215) and by Dupuytren, (communicated by M. Champion, 1838,) who, in 1833, related four cases of this kind to M. Champion, has furnished every where favorable results.

The patients thus operated upon, have a heel which has a great tendency to become ulcerated and excoriated; but in other respects the functions of the foot are not disturbed.

[*Exsection of the Os Calcis.*—In cases where the *tuberosity* of the os calcis alone is affected, excision, says Mr. Syme, (Cormack's *Lond. & Edinb. Month. Journ.*, &c., Feb., 1843, p. 95,) may be executed completely and certainly; and it is sometimes, though rarely, possible to extirpate the disease, even when it extends to the articulation, either directly by gouging out the carious part, or by making a perforation through it across the foot, and passing a seton, which may be made the vehicle of suitable applications, such as the red oxide of mercury, the mineral acids, or a saturated solution of the nitrate of mercury.

*Exsection of the Astragalus.*—M. Rognetta successfully extirpated the *astragalus* in a man who, in the terrific accident on the Versailles railway in May, 1842, had received a compound dislocation and fracture of this bone. What was remarkable, the limb, after recovery, retained its normal length, (Cormack, *Lond. & Ed. Month. Journ. of Med. Sc.*, Aug., 1843, p. 745.) T.]

[The cases related by our author must have escaped the attention of Mr. Guthrie, who has given to Mr. Hancock the credit of being the first to remove the os calcis for disease of its substance. (*Comm. in Surgery*, p. 100.) Among the British surgeons who have lately repeated this operation may be named, Messrs. Page, of Carlisle, Gay, Greenhow, Fergusson, Hancock and Wakeley, the latter, indeed, having removed both the astragalus and os calcis, an operation, pronounced by Mr. Guthrie to be worthy of imitation in similar cases. The particulars of this case may be found in the London Lancet, July, 1848. The astragalus has been successfully removed after compound luxations, by Dr. A. H. Stevens of this city, and Dr. Gillespie of Virginia. A similar operation was unsuccessful in the hands of Dr. Norris; in this case amputation was performed, and the patient died. In the *Brit. & For. Med. Chir. Rev.* July, 1853, Mr. Greenhow has given the particulars of twelve cases in which the os calcis was removed. In four of these Mr. Greenhow was the operator. In ten, the operation was successful. In the remaining two, the limb had, subsequently, to be amputated. In the successful cases the patients were able to walk with only a very slight halt, and the shape of the foot was not materially disfigured. G. C. B.]

### § III.—*The Leg.*

Next to the humerus, the bones of the leg present themselves for exsection; but it is rare that we ever operate upon more than one of these bones at once.

A. *Exsection of the Tibia.*—Up to the present time, exsection of the tibia has rarely been performed, except for necrosis or caries. In cases of osteo-sarcoma, or of spina ventosa, amputation would generally be preferable. Necrosis and caries of the tibia, moreover, are situated sometimes on the middle portion and sometimes on one of the extremities of this bone.

I. *The body of the tibia*, when its outer laminæ are in a state of necrosis, might easily be laid bare and excised with the crested or the rowel saws. The gouge and mallet, rasp, and chisel may also be employed here without any danger. For this operation, I am in the habit of making the incision into the soft parts, in such manner that the wound represents the arc of a great circle, with its convexity inwards, and then to dissect the flap from behind forwards, in order to turn it outwards. By this means we have full liberty to manipulate, with the saw or other instruments, from the inner towards the outer surface of the bone. The tegumentary flap thus cut out, may afterwards be easily brought down over the loss of substance. M. Heine says that his instrument has been employed in Germany six times in cases of this description, and M. Textor also used it in the years 1837 and 1838, on two patients who recovered. M. A. Séverin (*De Reconditâ Absessum Nat.*, etc.) rasped the bone of the tibia at its middle portion for an abscess, and Scultetus (*Arsenal de chir.*, Obs. 98, p. 130) cites a similar case, in which he had to make an incision into the parts, throughout the whole extent of the leg. A girl, in whom Benivenius (*Bonet*, t. IV., p. 600, Obs. 88) excised a great portion of the tibia, got perfectly well. Lecat, (*Planq., Bibl.*, t. XXIX.,

p. 129, in 12mo,) in the same manner, removed an enormous portion of the tibia in a putrid state, and covered with exostoses. J. L. Petit, (*Malad. des Os*, t. II., p. 229,) Bromfield, and Vigaroux (*Œuvr. Chir.*, 1802, p. 102, 398) have also reported analogous cases. M. Ducasse (*Journ. Gén. de Méd.*, t. LIII., p. 149) saw M. Vivès extract, with success, a long sequestrum from the tibia; and M. Wathely (*Practical Observations on Necrosis*, &c., 1815) was not less fortunate than M. Vivès. Cartier, (*Précis d'Obs. de Chir.*, p. 213,) who in this manner removed almost the *entire tibia*, found the new bone so soft that he was obliged to place it in a fracture apparatus.

David, (*Obs. sur la Nécrosis*, 1782,) Viguerie, (*Acad. de Toulouse*, 1788, t. III., Obs. 1, 2, 5,) Dussaussoy, (*Gaz. Salut.*, 1786, No. 28,) Laumonier, (*Medec. Eclairée par les Sciences Phys.*, t. III., p. 155,) and Hall, (*Gaz. Salut.*, 1776, No. 37,) have also taken out very large portions of the tibia, in a state of necrosis or caries. A sequestrum imprisoned in an ancient callus, was removed successfully in one case by M. Champion (communicated by the author) and in another by M. Sauter, (*Instruct. sur les Fract.*, p. 72, pl. 3.) M. Champion succeeded also in the same manner in two other patients in whom there existed an imbedded necrosis, and similiar facts are related by J. L. Petit, (*Œuvr. Chir.*, t. II., p. 31, 32,) Verguin, (*Journ. de Horne*, t. VII., p. 395,) and Cullerier.

Hey, (*Practs. Obs. in Surg.*, p. 26, 32, 34,) who operated on this bone the first and second time in 1792, and the third time in 1804, taking for his guide the caries, excised only the external laminae of the tibia. The same course was pursued by M. Champion, (*Thèse*, 1811, Champion, *Thèse* p. 90,)\* and Percy, and by MM. Graefe and Liston, (Jæger, *Opér. cit.*, p. 20.) Moreau, whose remarkable cases were collected and published by M. Champion, (*Thèse*, etc., p. 77, 79, 80, 82, 84,) performed partial excisions of the tibia six times, at different degrees of depth. Exsection through the whole thickness of the tibia in an old man, and afterwards upon a young man who lost in this manner an extent of four inches of the bone, was also successfully performed by this practitioner, (Champion, *Thèse*, p. 85, 86,) as it already had been also by Smith and Noblé, in a man who died of small-pox six weeks afterwards. MM. A. Cooper, Siebold and Wickham, (Jæger, *Op. cit.*, p. 20,) also severally succeeded with partial excisions upon this bone in destroying an exostosis, spina ventosa and hydatids.

In cases of *invaginated necrosis* the entire body of the bone may be dead. There are numerous examples of the kind on record, and in which nearly the whole of the diaphysis of the tibia had to be extracted. Without referring to the observations mentioned farther back, or to those related by Weidmann, Bousselin (*Observ. sur la Nécrose*, *Acad. Royale de Méd.*, Janvier, 1782,) Chopart, (*De Necrose Ossium*, 1776,) and M. Champion, (*Thèse*, etc., Obs. 22, p. 90.) I will cite the case of a young girl, who, after a putrid fever, had the whole body of the tibia necrosed from one epiphysis to the other. The dead cylinder was removed, and

\*[This fact (says our author in a note) is one of the most curious; the patient, Nicolas Grégoire, whom M. Nève again saw in 1829, having overheard MM. Breton, Hennequin and Oulied, discussing the nature of his disease, undertook to operate upon himself in 1803. He was three days occupied in this manner with the saw, chisel and hammer.]



M. Antheaume, the surgeon, showed it afterwards to M. Herpin, (*Constitution Méd. de Tours*, 1817, 2e trim., p. 14,) who relates the case and who states that this young lady was perfectly cured, so that she could dance and use all sorts of exercises as though she never had had any disease in the leg. M. Herpin mentions also the case of a soldier who, in consequence of a sabre-cut on the middle portion of the right tibia, was ultimately restored in the same way. The surgeon having divided the sequestrum into two portions, was thus enabled to extract them without difficulty, and cured his patient so perfectly that the latter no longer thought it necessary to ask for his retreat.

[Mr. Stanley (*On the Bones*, Am. Ed. p. 120) relates a case of necrosis of the entire shaft of the tibia which was under the care of Mr. Lawrence at St Bartholomew's Hospital. Mr. L. removed the dead bone, which "comprised the whole thickness and nearly the whole length of the shaft of the tibia." A new bone formed "giving to the leg firmness, together with its natural size and shape.

Through the politeness of Dr. Fuller, of Schenectady, we have recently had an opportunity of examining a boy some 15 years of age from whom about six years since he removed at least nine tenths of the shaft of the tibia in a state of necrosis. After the lapse of a year the boy gradually regained the use of his leg, the vacant space having been entirely replaced by new bone.

Mr. Adams of the London Hospital, has recently reported a case in which the whole shaft of the tibia, in a state of necrosis, was removed by him. He considers it a matter of importance to give sufficient time, in such cases, for the formation of a firm, bony case, before the operation of removing the sequestrum is undertaken. Although this may increase the difficulty in its performance, by it the security of the limb will be promoted. The strength of the patient also should be brought to the highest standard possible, before any operation is undertaken (*Rank's Abstract*, No. 18.) Mr. Curling, of the London Hospital, in a clinical lecture on necrosis of the tibia, has reported some cases in which, after the removal of the dead bone by operation, there was failure in ossific reproduction, and amputation became necessary. This is of rare occurrence, and Mr. Stanley cites the particulars of one case only. The remarks of Mr. Curling in his interesting lecture are worthy of perusal, and may be found in the *London Lancet*, Am. Ed. June, 1852, p. 439. G. C. B.]

This bone also is often diseased only in the centre, and in such manner as to present the necrosed fragments only under the form of splinters, or irregular sequestra. In the first case the probe strikes upon a sonorous, movable body, and apparently of considerable volume. In the second case the instrument indicates rugosities and fungous or anfractuous surfaces, but nothing irregular. In either case it becomes necessary to lay bare the swollen region of the tibia in its whole extent. If the hyperostosis should be found to be not over three inches in length, we should, after having laid it bare, by raising up a semilunar flap of the integuments, remove its vault with the trephine or the concave rowel-saw. By this means we make a large opening into the cavern of the tibia, which is to be then freed of the fragments and fungosities it contains, or even cauterized with the red-hot iron should its interior be affected with caries.

When the necrosis is actually invaginated, the tumefaction of the bone is usually very extensive. The great flap which I have spoken of being reversed from within outwards, places the whole anterior surface of the tibia under the eyes of the surgeon. We then make use of the crested, the small chain or coneave rowel saws, after which strokes upon the chisel, to evulse the osseous bridges and bridges which go from one fistula to another, and which obstruct the egress of the sequestrum to be removed.

This sequestrum being once brought into view, is easily removed if either of its extremities is free on a level with any part whatever of the breach we have made. In those cases where the two extremities towards the epiphyses, by being fastened there, do not admit of our loosening or extracting them, we should, after the manner of M. Herpin, break the sequestrum in its middle, in order to remove its two halves separately, by making tractions downwards upon the portion above, and upwards upon that below. To accomplish this, nothing more hardly is ever required than to insert the extremity of a spatula or a chisel or any solid lever whatever under the middle portion of the sequestrum, which latter is then to be raised up with some force by securing a point d'appui on the most solid part of the new bone. Dupuytren, however, found this in some cases so difficult that he got the manufacturer Charrière to construct a particular instrument for the purpose called *otseotriteur* (or bone-crusher) a kind of *exfoliating* trephine, which however is in other respects sufficiently complicated. The necrosis being removed, we smooth down the borders of the cavity which contained it, fill it with boulettes of lint, and gently bring in front of it the raised-up flap of the integuments.

II. *The Lower Extremity* [of the tibia.]—Up to a late period, caries and necrosis of the internal malleolus, were treated only by exsection or amputation of the articular extremity of the tibia. A practitioner mentioned by Theden, (*Neue Bemerkungen und Erfahrung.*, etc., t. I., p. 73, ou t. II., 2e part.) let one of his patients die from having ventured to operate upon him in a different manner. Theden also gives two other examples of the same kind. In this point of view, practice has made considerable advances. If the disease is situated external to the articulation, the coneave rowel-saw of M. Martin enables us to remove it without destroying the continuity of the bone, and without opening into the neighboring synovial cavity, so that we substitute a simple operation, which is attended with but little danger, and which exposes the functions of the foot to no inconvenience, to one which is of a serious nature and one of the most delicate in surgery.

To perform this operation, I cut a semilunar flap, having its free border anteriorly, and which I reverse from before backwards, upon its posterior border, and upon the apex of the malleolus internus. This being done, I carefully denude the bone of its periosteum and of the lardaceous tissues which surround it. While an assistant holds the tegumentary flap, turned back towards the heel by means of a roll of linen, the surgeon adjusts and guides the cutting edge of the mushroom-shaped saw from the anterior to the posterior part of the malleolus, while at the same time a skilful assistant turns the shaft of the instrument. Removing in this manner the bone layer by layer, we may excavate it deeply

without danger, provided we avoid the articulation below and the fibro synovial sheaths of the tendons behind. It is time to stop, however, as soon as the whole traumatic surface under the action of the saw presents a reddish tint and granular appearance, with bloody points. If some portions of this surface should continue yellow, and actually diseased to too great a depth, we should lay aside the rowel to attack them separately either with the trephine or chisel. I have performed this operation on the inner ankle only once; it was attended with no difficulty, and was followed by no serious accident; but the young man, though cured at first, was re-attacked some months afterwards, with caries of the radius, then of the pelvis, afterwards in the knee and same foot, and in this state returned to his home in the country. It would appear also that this operation has been performed once successfully with M. Heine's saw, (*Gaz. Méd. de Paris*, 1834, p. 644.)

III. *The Upper Extremity* [of the tibia]—The upper portion of this bone being spongy, thick, and very vascular, is frequently attacked with a complication of caries and necrosis, either in its center or on its surface. In a woman admitted into the hospital of St. Antoine, in 1828, for treatment of an enormous sub-patellar abscess, all that was found requisite was to cut down upon the integuments to the extent of three inches, in order to lay bare and remove a large necrosed lamina of the tibia. A young man who had had numerous abscesses in the upper part of his leg, had a necrosis there, situated so deep, that I was obliged in introducing the trephine, and afterwards the gouge, on a line with the spine of the tibia, to go from below upwards, and from before backwards, to within some lines of the articular cartilage, before I could thoroughly, destroy it. In another patient, whom I operated upon, at the hospital of La Charité, in 1836, I was under the necessity of destroying, by means of the concave rowel-saw, a great portion of the inner surface of the tibia, and afterwards of excavating into this bone by means of the gouge to the extent of several inches, making thereby a cavity large enough to hold more than one half the first. None of these patients died, but they were a very long time in getting well; the last mentioned, who was admitted into Bicêtre, was amputated three years afterwards by M. P. Guersant.

The operative process, moreover, in these cases, is entirely subordinate to the degree, actual situation and form of the disease; so that we have sometimes occasion for the crucial incision, or the elliptical or simple incision, and also for every variety of saws and osteotomes.

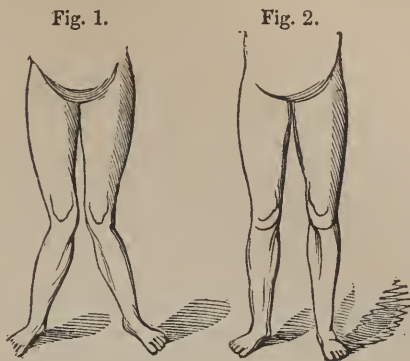
[The following interesting case of exsection of the tibia, was performed by Dr. Mayer of the Orthopædic Hospital at Würzburg. Its object was to remove the deformity known as *knock knees*, and as will be seen, it completely succeeded.]

John H—, a strong and healthy-looking boy of fifteen, son of a baker, and employed in his father's business, was found, on admission into the Orthopædic Hospital at Würzburg, to have the right leg diverging about seven inches, and the left about eight, from the direction of the corresponding thigh, as seen in the first figure of the accompanying sketch.

On the 14th of August, 1851, the lad having been put under the influence of chloroform, Dr. Mayer made an incision beginning three-quar-



ters of an inch below the insertion of the ligamentum patellæ, and curving downwards so as nearly to surround the front and inner (or mesial)



side of the head of the tibia. He then turned the flap upwards, and divided the periosteum in the line of the first incision, and afterwards with Heine's cutting-needle separated the periosteum from the outer and posterior surface of the tibia, so as to prepare for the use of the saw. To protect the soft parts in that situation during the sawing, a strip of watch-spring, about half an inch wide, was introduced between the denuded bone and the periosteum. Dr. Mayer then, with a round saw, made two incisions converging towards the posterior part of the tibia, and meeting about a line and a half from the surface, without therefore quite cutting the bone in two. The wedge thus excised was about five lines thick at its base, and was easily removed by the forceps. The wound was cleared of bone-dust by forcible injections of cold water, after which, through the flexibility of the remaining isthmus of the tibia and the mobility of the fibula, no difficulty was found in bringing the cut surfaces of bone into close apposition. The outer wound was brought together with the greatest accuracy by needles and ligatures (as for hare-lip), the hemorrhage being quite inconsiderable. The leg was then put into one of Boyer's hollow splints, used for fracture of the patella.

Half an hour after the operation, as through the perfect apposition of the divided parts no discharge of any kind was visible, the wound was covered with a thick layer of collodion, and upon this drying the ligatures and needles were removed. The traumatic reaction was very slight, and on the fourth day the external wound (five inches long) had perfectly united. The leg was now left quiet in the splint for twenty three days, when Dr. Mayer had the pleasure of finding that the incised surfaces of bone had united also. The next day the patient was allowed to walk in his room with crutches, and a few days afterwards in the garden without any artificial support whatever.

On the 3rd of October the other leg was operated on in the same manner and with the same success. He left the hospital, free from deformity, and with a firm and natural gait, on the 19th of November.—*Lancet*, June 18, 1853, p. 557. G. C. B.]

B. *The Fibula*.—The body of the fibula, as it would seem, may be destroyed without any serious inconvenience to the functions either of

the leg or foot. Desault, (*Jour. de Chir.*, t. IV., p. 254,) who proposed to excise in this manner an osteo-sarcoma, saw, it is said, a case, in which the loss of a great portion of this bone caused scarcely the slightest inconvenience in walking or standing.

Bourienne (*Journal de Médecine de Dehorne*, t. I., p. 215) speaks of a case, in which three fingers' breadth of the fibula was destroyed by a bullet, but which nevertheless recovered. The same result took place in a case cited by Gavard, (*Anc. Jour. de Méd.*, t. LXXIII., 1787,) in which a sixth part of the body of this bone was extracted, in consequence of fracture from a ball. Boyer (*Boyer, Malad. Chir.*, t. I., p. 241) also mentions a case of removal of the fibula by a ball in General Duch . . . , who however recovered.

I have elsewhere stated that Logan had exsected a portion of the fibula, in order to tie the posterior tibial artery. I will add also that Croxall, (*Annal. de Littér. Méd. Etrang.*, t. III., p. 375,) and Briot (*Essai sur les Tum. Artér.*, p. 135) imitated Logan or Gooch for other hemorrhages of the leg. Three inches of carious fistula were removed by Theden (*Pragr. Ullér.*, etc., p. 157) in a patient, who died some time after without being cured. The one, however, from whom M. Ouvrard (*Méditat.*, etc., p. 157) excised only an inch, got well.

[In cases where from loss of substance in the tibia the divided ends of the bones cannot be brought into apposition, Mr. Luke has proposed the excision of the fibula to an extent sufficient to admit of the object proposed. *Vid. London Lancet*, Am. Ed. June, 1852. p. 442. G. C. B.]

"We have," say Perey and Laurent, (*Dict. des Sc. Méd.*, etc.,) "a fibula entire, which we disarticulated above and below, in order to put a stop to an ulcerative state which occupied the whole outer surface of the left leg, and which had been produced and kept up by the almost general carious condition of this bone." We should state, however, that in a patient mentioned by M. Barbier du Boage, this destruction of the fibula, though partial, was followed by a manifest inversion of the foot inwards. It is, however, satisfactorily established, at the present day, that the body of the fibula may be excised through its entire thickness, and in the greater extent of its length, without the foot thereby necessarily suffering any inconvenience. We shall see further on what Béclard, M. Roux, and M. Seutin have obtained from this operation.

To remove in this manner the body of the fibula, a simple incision is required where there is only necrosis upon its periphery, or an elliptical incision, in case of swelling or tumor, which incision should be made in such manner, as to admit of our laying bare the bone throughout the whole length of its antero-external region. After having detached from its anterior and posterior surfaces the peroneus longus, peroneus brevis, extensor longus digitorum pedis, and soleus muscles, we should have to divide it at the malleolus below, and at its small head above, either with the small chain-saw, the crested saw, directed very obliquely, or the flat rowel-saw. The separation of the rest of the mass could be made with promptitude, and without any farther difficulty. The peroneal artery alone, which is the only one that might be wounded, could most generally be avoided. But the dressing would require some precautions. It would be necessary that the immovable dressing should

cover the entire inner side of the leg, so as to fix the foot and knee securely upon this side, without interfering with the daily dressing of the wound. A patient, in whom M. P. Guersant (*Jour. des Connaiss. Méd.-Chir.*, 1838, p. 189) excised a portion of the whole thickness of the fibula for ancient fungosities, recovered perfectly.

[In February, 1847, we saw a patient at the *Hotel Dieu*, on whom Blandin had successfully performed this operation. Mr. Elliot, of Carlisle, has removed some eight inches of the fibula, with benefit to his patient. G. C. B.]

If the disease of the fibula was only an invaginated necrosis, it could be operated upon in the same manner as for that of the tibia. In a young man upon whom I operated in this manner, I made a long curved incision from the upper attachment of the peroneus longus muscle down to the root of the external malleolus, so as to circumscribe a long flap which was semilunar and convex posteriorly, and which I dissected from the outer border of the leg to the anterior inter-osseal fossa. To lay bare the cavity, I used the crested saw, and afterwards the gouge and mallet; but as a solid (pleine) portion of bone separated the two fragments of the necrosis, I was obliged to avoid this middle portion of it, and to extract these fragments, the one from above and the other from below. The narrowness of the canal, and the great distance between the osseous fistulas in this case, suggested to M. H. Larrey, who assisted me, the idea of a small, fine saw, bent to an angle near its handle, and with which it would be easy to saw through the vault or covercle of the necrosis, from the interior to the exterior, upon the supposition that a long, flexible probe would not allow of conducting the chain-saw from one fistula to the other, as under the arch of a bridge. Be that as it may, this young man who was attacked with an angiolucitis of quite a serious character, and afterwards with small-pox, ultimately got well, without having any actual weakness in his leg.

II. *The Inferior Extremity* (of the fibula.)—The external malleolus, like the internal, and in truth much more than that, is liable to caries and necrosis. So long as the disease does not penetrate through its whole thickness, and has not invaded the synovial cavity, it may be attacked like the preceding with the trephine, rowel saw, gouge and mallet. One of the patients operated upon by Theden (*Neue Bemerkungen*, etc., trad. Franç., p. 98, 99) died, but the other recovered. In performing this operation upon a man who had had a caries in the external malleolus for two years, I found it exceedingly easy. A semilunar flap, reversed from before backwards to the outer side of the heel with the precaution, unless the extent of the necrosis should require it, of not opening into the synovial sheath of the peroneal muscles, constitutes the first stage of the operation. We have then laid bare before us the whole extent of the external malleolus. With the coneave rowel saw, directed by the surgeon, and the shaft turned by an assistant, we then remove successively from above downwards, and from before backwards, all the diseased laminae of the bone, which may in this manner be scooped out in form of a small eup or saucer. There is no artery of any size to avoid, and the attention of the surgeon has only to be directed to the tibio-tarsal articulation, or the fibrous sheaths of the peronei muscles. In another case, I found a simple incision quite sufficient to enable me



to remove with the forceps an isolated sequestrum from a necrosed malleolus.

#### § IV.—*The Femur.*

A nobleman, of Verona, had on his thigh an enormous ulcer, which had affected the bone with caries to such extent that the medullary substance ran through the opening. The application of caustics and sarcotics, had been had recourse to repeatedly. By means of a rasp I removed, (says Marchettis,) every portion of the bone in a carious state, until the blood oozed from the scraped surfaces. I then covered them with dry lint and applied sarcotics to the neighboring soft parts. In a few days after the bone was covered with granulations, which sprouted from the neighboring parts or from the bone itself; and this was shortly followed by the cicatrix. (Marchettis, *Observ. Medico-Chirurg. rar. Syllog.*, p. 130, obs. 57, 1665.)

In November, 1781, David, (*Observ. sur la Nécrose*, p. 13,) extracted a portion of the femur seven inches in length, and which was completely encased in an osseous cylinder almost as hard as the primitive bone, and the walls of which had already acquired a thickness of 7 or 8 lines, though the disease had existed only 2 years. He detached for that purpose to the extent of about 10 inches in length by 4 to 5 in breadth, integuments, aponeuroses and muscles, in such manner as to lay bare the new cylinder, and to be enabled by means of the gouge and mallet to make an opening of sufficient size to extract the dead bone. The fever lasted but twenty-four hours; no accidents ensued, and the cure was *almost* completed at the time David wrote.

“A child, aged fourteen years, says Viguerie, (*Mémoire de l'Acad. de Toulouse*, t. III., an 1788,) was admitted into the Hôtel Dieu, with the lower part of the right thigh double the size of the left; it was easily perceived that the tumefaction was osseous. At the lower part of this swelling there was an ulcer, through which the sound reached the dead bone at the depth of two inches. I laid it bare by means of caustic, and with the aid of the forceps extracted a cylindrical sequestrum of five inches in length. The osseous cavity from which I had removed it was still some days after sufficiently capacious to allow of its being replaced. M. Gardeil came to examine it. I was desirous in his presence of replacing the dead bone in the new one; he begged me to desist. The inspection of it, said he, is sufficient for me. He contemplated this process of nature with the satisfaction which a man of talent experiences when beholding such marvellous results.”

No one certainly would venture to remove the body of the femur affected with cancer or degeneration of a bad character. But like the tibia and humerus, this bone is frequently liable to different kinds of necrosis. Castel, (Champion, *Thèse* No. 11, Paris, 1815,) in the case of a soldier, adopted with success the plan of Marchettis. Bousselin, (*Obs. sur la Nécrose*, obs. 4 and 8,) has seen a case in which almost the whole of the diaphysis of the femur was extracted without the patient being thereby rendered infirm. M. Champion, also, speaks of a man who it is said had lost a fragment of the femur four inches in length, whose thigh became shortened to the same extent, but who was ultimately ena-

bled to walk. In the femur in fact as in every other bone, the sequestrum is not formed without a kind of new bone being developed in place of it as its substitute. Under this point of view we may extract without danger the largest description of necrosed portions of the thigh. The delicate part of this matter is that which relates to the operation. No part of the body of the femur is exposed and superficial like the tibia, or even like the humerus. Moreover, it is almost always upon the inside or posterior part of the thigh that abscesses and fistulas caused by the necrosis, find their exit; in which regions the number of the muscles, and the size and importance of the vessels and nerves, are naturally calculated to create in the mind of the surgeon the greatest degree of circumspection.

There are two modes of reaching these necroses in the thigh bone; one by election represented by the antero-external region of the limb, and the other that of necessity, indicated by the seat of the disease. However few openings, therefore, or however little attenuation of the laminae there may be on the convex portion of the femur, it is there nevertheless that we must endeavor to lay it bare to attack the disease. The curved incision and the semilunar flap of which I have already spoken would be of great advantage here. Raised up from without inwards and from behind forwards, they would allow of our laying bare the bone to a great extent. We are then to make use of the different kinds of saws and scissors we have described in speaking of the tibia. The wound also is to be closed and dressed in the same manner. When the fistulas are immediately behind, the operation would be too dangerous and difficult to be undertaken, unless the sequestrum should, as it were, present itself of its own accord to the instruments. Suppose the disease should be outside of the sharp line of the femur, we might come down to it between the vastus externus and the biceps muscles. Provided there should be a chance of finding the diseased point upon the inner part of the thigh, we might also hazard the attempt of laying that part bare by cutting down upon the posterior insertion of the vastus internus muscle.

A young girl who was afflicted for many years with a necrosis in the lower part of the femur, and who had had a great number of abscesses in this region, was received into the Hospital of La Charité in the month of July, 1838. Having ascertained that a voluminous sequestrum existed in the centre of the thigh bone, which was otherwise considerably hypertrophied, I made, at the distance of five fingers' breadth above the knee, an incision of four inches' length, which, in crossing the fibres of the vastus internus muscle, penetrated nearly down to the bone. A strong sickle-shaped scalpel, and a few strokes upon the chisel which was directed so as to act as a lever, enabled me to enlarge to sufficient extent the principal osseous fistula. Then seizing hold of the sequestrum with a strong pair of forceps, I ultimately succeeded in loosening it and extracting it entire, though it was nearly four inches long, and included nearly the whole thickness of the cylinder of the thigh at its lower extremity. One single ligature only was required, and simple dressings. The young girl had no accidents, and perfectly recovered.

II. *The Great Trochanter.*—The great trochanter, being separated from the common integuments externally by a bursa mucosa, and having

on its posterior part between the tendon of the gluteus maximus and the neck of the femur, a small synovial sac, and being also the common point of insertion for most of the muscles of the pelvis or hip, is consequently exposed to the action of numerous causes of disease. From whence it happens that it frequently becomes the seat of caries and necrosis, and the source of abscesses and serious accidents. An adult man was attacked with pains, afterwards an enormous abscess and fistulas formed below the breech; three years of his life were dragged out in this manner, and he appeared to be on the point of sinking under the exhaustion produced. The thigh was taken off at the joint, when the great trochanter alone was found in a state of caries. A boy, fifteen years of age, had between the breech and the postero-external region of the thigh an enormous abscess, which was ascribed to disease in the bones of the pelvis or spine. The examination of the dead body proved that the evil originated in the great trochanter. The case of another young man, an individual aged 40 years, a boy aged 13, and a woman who died after lying in, together with 3 or 4 other patients whose bodies I have been enabled to examine after death, exhibited the same kind of lesions, and have proved to me that the great trochanter alone is often affected in such manner as to admit of its extirpation, in cases which would appear to indicate disarticulation of the thigh or abscesses by congestion. The consideration of these facts, and the cases of destruction of the great trochanter related by Gelée, (*Journ. de Méd. Milit.*, t. IV., p. 230,) Le Dran, (*Obs. Chir.*, t. II., p. 286,) M. Knox, (S. Cooper, *Dictionnaire de Chir.*, t. II., p. 156,) and Cadran, (Bagieu, *Examen de plusieurs Quest. de Chir.*, t. II., p. 493,) soon suggested to me the idea of an excision of this part, which Tenon, (*Mém. de l'Institut*, an VI., t. I., p. 208,) had broached, and M. Champion, (*Thèse*, etc., p. 67,) formally recommended, and which M. Kluge and M. Jæger, it is said, had also suggested. I made trial of it on the dead body in 1832; and this operation was performed by me for the first time, at the Hospital of La Charité in the month of November, 1835. I have since performed it again upon a student of medicine in the year 1836.

The first case was that of a woman, aged forty years, the external and upper portion of whose thigh had been in a state of disease for ten years, and perforated with fistulous openings. Having satisfactorily ascertained, and with the concurrence also of the opinion of M. Mott, who was then at Paris, that the great trochanter was in a carious condition, I laid bare this process by means of a T incision, the stem of which, directed transversely, extended from the anterior border of the great trochanter to two inches behind it, towards the tuberosity of the ischium. I had thus two triangular flaps, which I dissected and reversed upon their base, the one above and the other below. While one assistant held them down and another drew the anterior lip of the wound towards the groin, I removed lamina by lamina, by means of the concave rowel saw, directed from before backwards, almost the entire substance of the great trochanter. No serious accidents supervened, and many months were required to complete the cicatrization of the wound; but the patient ultimately left the hospital perfectly cured.

The young man mentioned, had had from his infancy, and in conse-



quence of an enormous abscess, a sinuous ulcer, opposite the great trochanter, which from time to time brought on attacks of erysipelas and a renewal of the suppuration. Believing that the sub-cutaneous mucous bursa was its point of departure, I had, two years before, completely excised this pouch. As the ulcer was not thereby closed, and as the same accidents were reproduced, I was convinced that the great trochanter itself was actually diseased. The courage, moreover, and firm resolution of M. D——, emboldened me to undertake upon him the operation which had succeeded so well in the woman whose case I have just described.

I adopted the same course in respect to the incision and the dissection of the integuments. I also removed, by the same process, with the concave rowel saw, a portion of the laminae of the osseous projection; but having ascertained that the caries and necrosis in some measure perforated, but in a very circumscribed space, through the whole thickness of the great trochanter, I concluded to substitute for the saw, first the trephine, and then the gouge and mallet. The operation was thus rendered longer and more painful; nevertheless, the totality of the disease was removed; the accidents were of a trifling character, and the cure has continued complete up to the present moment, (Jan., 1839.) Even before the expiration of two months after the exsection, M. D. was enabled to go out, and to resume in part his usual occupations.

[Mr. Fergusson states that he has known several instances where the trochanter major was cut down upon and removed with a saw, in consequence of caries, and that he has seen others where such practice might have been of service. He has twice removed the entire trochanter. In one case, the wound was attacked with violent erysipelas, which extended over the thigh and carried off the patient within a week; in the other, the result was a satisfactory cure. (*Pract. Surg.* 3d Lond. Ed. pp. 467, 474.) This operation has been successfully performed by Prof. Parker of this city. G. C. B.]

These facts decide the question beyond dispute, that the excision or exsection of the great trochanter may be successfully performed upon living man. It is easy to perceive, also, that the process to be adopted cannot be the same for all the cases. To lay bare the bone and remove it, by one mode or another, is the principal object in view. The operation is constituted of two portions: one the division of the soft parts, the other the excision of the osseous tissues. If the integuments are not degenerated to great depth, nor strongly adherent to the femur, a semilunar flap, having its base behind the great trochanter and its convex border in front, is preferable to any other kind of incision. Laying bare the whole bone on its external face and anterior border, it enables us to detach from it afterwards its posterior border and apex, without the necessity of changing the primitive form of the wound. Upon the supposition, on the contrary, that numerous and large cicatrices, and fistulas, and ulcers, had totally changed the nature of the parts, we must be guided by them in our construction of the flaps.

The great trochanter, after being laid bare, may be exsected by means of the hand-saw or crested saw, directed from before backwards, from without inwards, and slightly from below upwards. These instruments

even would be preferable to all others, if it became necessary to remove the whole of this process from the femur. In cases, on the contrary, where the caries or necrosis has more breadth than depth, it would be better to make use of the concave rowel or a large flat rowel, seeing that this kind of saw enables us to avoid the insertion of the three glutei muscles, and dispenses with the necessity of proceeding as far as the synovial cavity, situated upon the posterior part of the neck of the femur. If, as in the case of the student of medicine which I have just given, the caries, though deep, occupied but a very limited space, it would be better to embrace it within the crown of a trephine, and to make use afterwards of the gouge and mallet, rather than to have recourse to the instruments of which I have been speaking. We are enabled, also, by this means, to avoid the same tendons just spoken of, and to destroy every thing which is diseased, without necessarily excising through the whole thickness of the great trochanter.

If, however, the crown of the trephine has to be carried to the point of penetrating through and through the whole extent of the great trochanter, there would then be less danger, I think, in removing the entire process by means of the ordinary saw, than by boring it in the manner described. The tissues are too relaxed, and purulent collections take place too readily and are too dangerous behind the coxo-femoral articulation, not to induce us to endeavor, by every means in our power, to respect the parts in question and to avoid entangling them at least with any species of constriction in the direction towards the surface.

The vessels to be avoided in this operation are generally of inconsiderable size. The posterior circumflex artery, when we are obliged to penetrate to a great distance behind, and the anterior circumflex if the incisions are much prolonged above and in front, are in fact the only arteries which require our attention, or may have need of being tied.

During the whole time of the operation, the patient should be kept upon his sound side, with the thigh in a state of semi-flexion during the incisions upon the skin—to be placed in complete flexion, with adduction and rotation inwards, at the moment of performing the excision or excision of the bone. By this position, the trochanter is naturally liberated from between the muscles and the lips of the wound. Adopting this course also, we find, when we afterwards straighten the limb, that the wound, in great part, closes of itself, and the denuded surface of the bone is made to conceal itself underneath the integuments of the thigh.

If we should go too far and too deeply in the posterior region, we might possibly wound the great sciatic nerve, or the descending branch of the ischiatic artery. The gluteus minimus, and medius muscles, which are attached to the upper border and to the front part of the great trochanter, need not be implicated, unless we are obliged to remove the entire process. In this last case it is still advisable if we can, and if the extent of the caries permits, to save the gemelli muscles and the pyriformis and obturator externus; but there is no way of avoiding the quadratus femoris muscle, except by restricting the excision as much as possible to the outer surface and middle portion of the great trochanter, whether we use the concave rowel saw, the trephine, gouge, or chisel.

It will be exceedingly rare that we can ever dress the parts in such

manner as to undertake immediate reunion. The tissues in these cases are endowed with too unequal degrees of vitality; the wound presents layers that are too dissimilar and too much altered to admit of our attempting primitive agglutination. I would therefore recommend that we should apply naked upon the wound small balls of lint over all the anfractuositities of the traumatic surface, that we should gently arrange the flap over these boulettes, by means of a few strips of adhesive plaster, and then cover the whole with the perforated linen, spread with cerate, succeeded by a large gateau of lint, a few compresses, and the square bandage, or the pelvic spica lightly put on. [See Vol. I. for a description of *Dressings*.]

The patient being carried back, or having returned to his bed, should be kept there, either on his back or partly on his side, with the leg and thigh very moderately flexed and supported upon a cushion.

As after all exsections or excisions in the continuity of the bones, we must not in these cases, proceed to the second dressing until after the second or third day, unless there should be particular indications to the contrary. The dressing is then to be repeated daily with the same articles as used in the first, and until the whole interior of the wound shall have acquired a healthy aspect, assumed a rosy tint, and become covered with uniform cellular granulations. It is then only that we can dispense with the boulettes of lint without inconvenience, or think of contracting the wound; in this matter, however, we should still err in being in too great haste. We had better delay a week than go forward too fast. In leaving the solution of continuity to close up by second intention, we are almost certain to escape the danger of inflammation and purulent collections in the neighborhood of the external iliac fossa, or the coxo-femoral articulation, besides having much less to fear from the denudation and suppuration of the periosteum.

There is no impropriety, moreover, if every thing goes on regularly, in permitting the patient to get up and walk about even after the second or third week. In conclusion, the exsection of the great trochanter appears to me to be an operation susceptible of frequent application, and of a nature calculated to prevent in some instances the necessity of disarticulation of the thigh. I will not terminate this subject without adding that the free border of the semilunar flap, of which I have spoken, may, instead of being brought in front, be placed almost with the same advantages behind, below, or even above, should the diseased condition of the integuments seem to render it necessary.

#### [EXSECTION OF THE FEMUR.]

2/p. 678 M. Ollagnier, a military surgeon, doubts the propriety (See *Gaz. Méd. de Paris*, 1848, and *Jour. des Connaiss.*, &c., de Paris, Mars, 1848, p. 113—114) of rigidly adopting in every instance the law in surgery of amputating the thigh in comminuted fracture of that bone from gun-shot wounds, where the fragments cannot be removed; but proposes as a substitute, where the fracture is in the upper fourth of the femur, and where the soft parts are not so lacerated as to threaten gangrene, nor the principal nerves and vessels injured, that we should exsect the bone under the great trochanter. For this purpose, he adopts



the simple incision, as directed in exsections of this bone, in the text of our author, M. Velpeau, (above,) with a slight modification. His process is as follows:—An incision from the middle of the space comprised between the anterior superior spinous process of the ilium and the great trochanter, made in such manner as not to wound the capsule, but to enable us to explore with ease the neck of the femur, and to appreciate the extent of the disease. If exsection is intended, the incision should extend to four fingers' breadth below the great trochanter, and if it should become necessary to remove the neck of the bone, the capsule will have to be opened. The surgeon should take care, at first, to extend the incision no farther down than to the great trochanter; for if the lesion should indicate disarticulation of the femur, the wound will be quite sufficient, and the operation may be performed in the manner recommended by M. Baudens. If, however, the upper part of the thigh can be preserved, this wound would be a complication of little consequence, and amputation could be made in the continuity of the bone, which operation, M. Ollagnier states, has been attended with much more success in the late campaigns of the French army in Africa, as well as everywhere else, than disarticulation. It is thus perceived, that M. Ollagnier says nothing of the proposed law of M. Syme, of Edinburgh, (see above,) never, when disarticulation is not necessary, to amputate elsewhere than at the great trochanter or the condyles. T.]

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## PART SECOND.

### EXSECTION OR EXCISION OF THE ARTICULATIONS.

Though there may be no articulation in the limbs at the present day, upon which exsection has not been made trial of, there are some upon which this operation has been much more frequently employed than upon others. As a general rule, exsection is much better adapted to the thoracic than to the pelvic extremities; and there so much the more so, as the articulation is less approximated to the trunk. Though apparently of modern origin, exsection of the articular extremities of the bones was not unknown to the ancients. Hippocrates alludes in vague terms to that of the foot and hand;—ET IN TIBIA AD MALLEOLOS, ET IN CUBITO AD JUNCTURAM MANUS. It is very natural indeed, that ignorant as they were of all hemostatic means, they should have preferred all operations that would enable them to avoid amputation of the limbs. None of them however furnish us with the details of the processes they followed. It is from the time of White, only, that exsection of the joints became recognized as a distinct operation in surgery; and it was about the middle of the last century that we have in England the first formal recommendation to exsect the articular extremities of bones that had become dislocated and had perforated through the tissues. It was Gooch, (*Cases and Practical Remarks in Surgery*, p. 323, 1737,) Cooper, of Bunghay, (Gooch, *Opér. cit.*), Kirkland, (*Thoughts on Am-*

putation, &c., &c., 1780,) the surgeons of the hospital of Liverpool, (Park, *Cases of the Excision of Carious Joints*, p. 73, 1806,) (of whom Park was one,) and Lerr, Hey, and B. Bell, who regularly established this operation in that country.

In 1776, the same doctrine was promulgated in France by Bourbier, (*Dissertat. Med. Chirurg.*, De Necessitate et Utilitate, &c., § XXI., 1776:) In luxations, says he, where the bone protruded out of the articulation, presents considerable length and resists reduction, *the only means of safety left at the disposal of the surgeon, is to exsect the projecting bone*; but the operation continued at first to remain there completely unknown. Lassus, (*Nouv. Méth. de traiter les Malad. qui attaquent l'Articul. du Coude et du Genou*, par Park, p. 6, 1784,) who, in 1784, alludes to the recommendation of Gooch, and his practice, and that of Cooper, of Bungay, is silent upon this subject, in his notes to the Treatise of Fractures by Pott, in 1788. So that it is not until the year 1789, that we meet with the recommendation of exsection of luxated bones, in our classical words. Manne it was, who was the first among us to propose it, (*Traité Elém. des Mal. des Os*, p. 266, 1789.) As Park, *Nouv. Méth.*, &c., trad. par Lassus, 1784,) who in the beginning was desirous of extending exsection to all the joints, ultimately attached much less importance to it, it was Moreau, (*Obs. Prat.*, etc., 1803; *Rèsec. des Os*, etc., 1816,) in fact, who was the first to demonstrate its advantages to the surgeons of Europe. The dissertation of Waelter, (*De Art. Extirpan.*, Gron., 1810,) published in 1809, being much more theoretical than practical, would have remained in oblivion, like that of Chaussier, (*Soc. Med. d'Emulation*, t. III., p. 397, but for M. Champion, (*Thèse de Paris*, 1815,) who, by new facts, dispelled the last doubts on this subject that lingered in the minds of the Parisian surgeons. The observations of MM. Roux, (*De la Resec.*, &c., 1812,) Jeffray, (*Excision of Carious Joints*, &c., 1806,) Crampton, (*Arch. Gen. de Med.*, 1er série; *Dublin Hospital Reports*, Vol. IV.,) and Syme (*Excision of Diseased Joints*, 1831) have finally succeeded in fixing public attention upon this subject.

Exsection of diseased articulations, however, is not yet approved of at the present time by all practitioners. Compared with amputations, in fact, its advantages and disadvantages are so balanced, that it is allowable to hesitate before according to it any absolute utility. Its manual process, which is delicate, painful and ordinarily very long, presents under some circumstances numerous difficulties, and necessarily involves acute suffering: also it may incur the risk of not removing all the mischief.

As it removes the bones only, it necessarily leaves behind the greater part of the other degenerated tissues. The wounds which are produced by it being extensive and irregular, almost always become the seat or the source of an abundant suppuration. The cure, too, even when it does take place, is not effected until after the expiration of many months, sometimes not until after several years. The limb being more or less shortened, often immovable, and generally drawn by the muscles into one direction or another, remains moreover sufficiently deformed to be rendered incapable of performing more than a limited part of its functions.

Amputation being generally easy and prompt, and consequently less

painful, immediately disembarasses the patient both of the bones and all the soft parts that are diseased. Acting upon sound tissues, it leaves a smooth wound, one easy of union, less extended, less disposed to suppurate, and less favorable to the development of phlebitis and metastases.

The cure which is more probable and more speedy, is also more free and more complete.

To these objections, however, which are not wanting in force, it may be replied, that it is for the skilful surgeon to know how to surmount the difficultiss of the manipulation in exsections, and to abridge their duration, and determine whether he can or cannot remove all the mischief. The bones being once removed, the surrounding tissues, however changed they may be, return most usually to their natural condition. The fungous or lardaceous degenerescence of the synovial capsule, ligaments, cellular tissue and skin, is not always an obstacle to the cure. The principal arteries, veins and nerves being avoided, the operation ought in reality to produce less shock upon the rest of the organism than amputation properly so called. Certain patients moreover get well with great rapidity, as M. Syme mentions cases in which they were enabled to make use of their limb at the expiration of a few weeks. The new substance which is formed in the place of the osseous extremities excised, acquires a sufficient degree of solidity, to replace to a certain extent the articulation and to admit of voluntary movements. By means of splints and skilful dressing, we may counteract every abnormal deviation of the limb, and prevent its ankylosis by habituating it in time to proper movements. In fine, however deformed we may consider it, this limb will always be adapted to a greater or less number of uses which the patient would regret to be deprived of. In the aggregate the number of advantages in exsection is greater than its inconveniences. It is therefore an operation, which rigidly examined, deserves to be reckoned among the efficacious resources of surgery.

The preparatives for the operation, are composed : 1, of the same objects as those for amputation, in order that if unexpected accidents or circumstances should arise, at the moment of the operation, we may be enabled to proceed immediately to the removal of the limb, in place of restricting ourselves simply to exsection ; 2, of some particular articles, as for example, strong spatulas, gouges, a leaden hammer, chisel ; hand, crested, rondache, semicircular, or chain saws, and that of Macbell, and the flexible saw, as frequently used by the English and American surgeons ; M. Heine's saw, the rowel saws, that of M. Thall, the osteotomes of M. Zeiss, and the cutting pliers of M. Liston ; 3, finally of one or more thin pieces of pliable lightwood, pasteboard, sheet-lead, or any other metal, or merely narrow compresses, folded several times double, and suitable for slipping in between the bones and soft parts. We must have, moreover, for the dressing, one of the bandages of Scultetus, cushions, and splints, or what is better the starched bandage.



## CHAPTER I.

## THE THORACIC EXTREMITY.

## ARTICLE I.—THE HAND.

If the anterior third, or the posterior third, of 1 of the 4 last bones of the metacarpus, or of any phalanx, was alone diseased it might be removed without requiring the removal of the finger. Many surgeons have undoubtedly thought of, and some have performed this operation, as is shown by several theses, supported at the beginning of this century. It is to Troccon, however, to whom we are indebted for having proposed to subject this operation to certain fixed rules. M. Wardrop, (*Trans. Méd. d'Edinburgh*, 1819,) who removed in this manner the head of the second metacarpal bone, is far from being the first who performed it on living man. Galen, (*Opera apud Juntas*, t. I., lib. 3, cap. I., p. 72 bis) relates that a surgeon of much repute, by dividing a bone of the wrist, which was sphacelated, rendered the whole palm of the hand sensitive by the manner in which he operated, for want of sufficient anatomical instruction. Bilguer, (*Diss. sur l'Inut. de l'Amp. des Membres*, p. 70,) says that in wounds from fire-arms, he has detached and removed the bones of the hands entire, either where they were fractured and shattered or not. M. Textor has removed the os magnum in a carious state, Jæger, (*Œuvr. cité*, p. 23, No. I.,) together with the posterior extremity of the third bone of the metacarpus. In a case of M. Champion, (*Résect. dans la Continuité*, p. 59, 1815,) after the exsection of the anterior half of the fifth bone of the metacarpus, the movements of the finger were re-established, although it was an inch shortened. Vigarous, (*Œuvres Chir. prat.*, p. 435,) by means of an incision on one side of the index finger, extracted the second phalanx in a state of necrosis, and also its epiphysis, which had separated from the body of the bone. A perfect cure was effected in thirty-three days, and the patient could afterwards use his finger with the greatest advantage.

## § I.

The luxated and irreducible head of the *first phalanx* of the thumb was excised in this manner successfully at the time of Cooper, (*Practical Treatment of Wounds, &c.*, 1767,) or Gooch, and Lassus, (*Trad. de Park*, p. 7, 1784,) and afterwards at the beginning of this century, by M. Bobe, (*Journ. Gén. de Méd.*, t. XXVI., p. 163; t. XXVII.) M. Evans, (*S. Cooper, Dict., &c.*,) effected two similar cures, and M. Roux, and M. Textor, (*Colon, Thèse*, Wurtzburg, 1833, p. 46,) have been no less fortunate on other metacarpal bones.

In these cases, moreover, exsection forms but a stage of the operation of extraction, properly so called, of the same pieces of bone. After having divided the integuments, separated the extensor tendons, and grazed the bone on each side in order to detach from it the inter-osseous muscles, and after having disarticulated the extremity, correctly ascer-

tained, of that which we wish to remove, there is no more to be done than to glide a piece of wood, pasteboard, &c., underneath its anterior surface, then to make its section slantingly, (*i. e.*, bevelled,) or perpendicularly, by means of a small saw, such as the chain saw of M. Jeffray, or that of M. Rambaud.

The surgeon of the present day having at his command instruments better adapted to the operation, would not be under the necessity of attending even to so many precautions. The incision of the integuments being made, he would divide the bone with Liston's cutting pliers or the flat rowel-saw, and then terminate with the disarticulation. The corresponding extremity of the phalanx would be extracted in the same way, if it participated in the disease. M. Fricke (Grenet, *Arch. Gén.*, 1838, t. II., p. 87. This name is written *Guernet*, in the *Dict. de Méd.*, art. MAIN; and Gernet, *Gaz. Méd.*, 1837, p. 555,) who confined himself to the excision of the third metacarpal bone in one case, excised the entire metacarpo-phalangeal articulation of the thumb in three other patients. As the tendons are not destroyed in this kind of operation, the fingers which are saved are enabled to resume a part of their functions.

"The first, second and fifth bone of the metacarpus," says M. Champion, (*De la Résection des Os, Thèse de Paris*, No. 11, 1815,) "may be excised in part without involving the loss of movement in the fingers, inasmuch as the incisions are made laterally, and the extensor and flexor tendons thus avoided; the consolidation even is not an obstacle to the success of this operation."

## § II.—*Extraction of the First Bone of the Metacarpus.*

It may be conceived that this bone may be in a state of necrosis, caries, or degenerescence, without the thumb and carpus being implicated in the disease, in which case it would be important to be enabled to remove it while preserving all the other parts. Troecon (*Amp. Part. de la Main*, etc. 1816,) in 1816, maintained the practicability of making this extraction. Nevertheless M. Roux (*Bull. de la Fac. de Méd.* t. VI., p. 156) appears to have been the first who made a practical application of this suggestion upon living man. The thumb, in his patient, which at first could not be put to any use, gradually acquired its natural functions, so as to be enabled to execute very considerable movements. The same practitioner has since been equally fortunate in two other cases. I am acquainted with a person, who, after the first phalanx in a state of necrosis had been extracted by piecemeal, preserves nevertheless all the movements of his thumb. I was not aware, in 1825, that M. Troecon had spoken of it, and as M. Roux had nowhere given a description of his operation, I deemed it proper to enter into some details as to the best method to be adopted (*Anat. des Régions*, t. I., p. 458, 1825.) The operation having been performed again in 1827 by M. Blandin, (*Nouv. Bibl. Méd.* 1828, t. I.,) we may look upon it at the present time as one which is regularly established in surgery.

[Professor Syme has excised the head of the metacarpal bone of the thumb, dislocated into the palm of the hand. The thumb was bent

back, so as to be unable to co-operate with the fingers, and had remained in this position for eighteen years. After the removal of the head of the bone, the thumb was readily placed in its natural position, and gradually regained its mobility. (*Supplement to the Principles of Surgery*, Ed. 1851, p. 29.) G. C. B.]

*First Process.*—We commence with an incision upon the radial border of the bone, which it is important to prolong at least half an inch posteriorly and anteriorly [beyond the part diseased? T.] We then cautiously detach from its dorsal surface the integuments and the tendon of the extensor secundi internodii pollicis; we then do the same with the opposite muscle and the tendon of the flexor longus pollicis manus, which cover its palmar surface. While an assistant keeps apart the two lips of the wound, the surgeon directs the point of his bistoury upon the outer side of the carpal articulation, divides the tendon of the extensor ossis metacarpi pollicis, or even that of the extensor primi internodii pollicis, while carefully avoiding the extensor secundi internodii pollicis; then destroys all the ligaments and all the fibrous parts which unite the metacarpal bone to the trapezium, and endeavors to luxate this bone outwardly, either by a simple pendular movement or by drawing upon it in that direction with the forceps; he then seizes it with two of his fingers, glides the bistoury along its ulnar side in order to separate the tissues from it, and disarticulates it while dividing in succession the internal lateral ligament, the external lateral ligament, then the anterior fibrous layers which unite it to the thumb, which latter is thus left still invested with its tendons of the extensor secundi internodii pollicis, the flexor longus pollicis manus, the abductor pollicis manus, the flexor brevis pollicis, and the abductor pollicis, while at the same time we preserve the whole thenar eminence entire. Nor is it necessary to divide any artery of any considerable size. Consequently it is rare that we have occasion to leave the threads in the wound, the two lips of which latter are brought together from before backwards, and maintained in this state by means of small graduated compresses or by lint, and then strips of adhesive plaster or a few points of suture. The palm of the hand is then padded in a proper manner, in order that the thumb may be kept by means of a bandage in its natural position.

*Second Process.*—Performed in this manner, however, the operation is long and difficult. I have since found that it is rendered incomparably more prompt, by making use of M. Liston's cutting pliers to divide the bone near its extremities, after having isolated the soft parts from them. If one of the articular heads itself is diseased, the same pliers used upon its sound portion renders its extraction more easy. In fine, excision is preferable here to disarticulation. [It will be seen by our abrégé below, of M. Chassaignae's processes of exsection throughout the body, that M. Velpeau herein virtually gives the preference to the leading or ruling principle of those processes, to wit, that of excision always *before* disarticulating. T.]

### § III.—*Extraction of the Middle Bones of the Metacarpus.*

Troceon did not limit himself to recommending the extraction of the metacarpal bone of the thumb alone. He is of opinion that we may



perform the same operation upon the others. I have often practised it upon the dead body, and am bound to say, that with an accurate knowledge of the articulations, we may perform it without any very great degree of difficulty. M. Dietz (Coulon, *Thèse*, Wurtzburg, 1833,) by operating in this manner, was enabled to preserve the fore-finger of his patient. We make an incision which is to reach from the carpal extremity of the fore-arm to half an inch in front of the phalangeal articulation, while taking care to avoid the extensor tendon. Then in order to disarticulate the bone posteriorly, we proceed as above directed. When it is luxated we seize it with two fingers of the forceps, while with the point of the bistoury we proceed to divide the posterior part of the capsule, the lateral ligaments and anterior ligament of the other articulation, always carefully avoiding the extensor and flexor tendons of the corresponding finger.

In place of commencing posteriorly as Troceon recommends, I think with M. Blandin, who re-introduced this subject in 1828, that it is better to disarticulate the phalangeal extremity first, and terminate with the section of the ligaments of the carpus; but it is probable that this operation will continue to be for a long time, with the greater part of practitioners, nothing more than one that has been merely projected. Exsection of the diseased bone appears to me to be an operation calculated to be advantageously substituted for it on almost all occasions.

M. Textor (Coulon, p. 35, *Thèse*, Wurtzburg, 1833) was enabled to remove the articular extremity only of the third metacarpal bone, and yet preserve the finger. When once laid bare upon its dorsal surface, each bone of the metacarpus could be divided either posteriorly or anteriorly very near its articulation, by means of M. Liston's pliers, and removed without any great effort. Examined in this point of view, the operation is one of very great simplicity, and cannot be assimilated in any respect to the *exarticulation* of Troceon.

In one case I exsected the posterior extremity of the two last metacarpal bones, with the unciform bone; in another, the cuneiform bone alone; and in a young man, the phalangeal extremity of the third metacarpal. One of the patients died; the others remained a long time in the hospital.

#### § IV.—*Extraction of the Fifth Bone of the Metacarpus.*

From its having been found practicable to remove the first metacarpal bone and at the same time to save the phalanges, the same operation has been suggested for the metacarpal bone of the little finger. It is an operation which is no doubt possible, and even sufficiently easy, but it is of less importance than at the thumb; so that the preference will always probably be given in these cases to simple disarticulation with the simultaneous removal of the finger. If, however, extirpation should be decided upon, this is the manner in which we should proceed. A dorsal incision extended from the head of the ulna to the middle of the ulnar border of the first phalanx of the little finger, would enable us to detach the bone from the tendons and other soft parts which cover its dorsal and palmar surfaces. An assistant should be charged with separating the lips of the wound apart, while drawing them at the same

time towards the radial side; the surgeon would then divide with the point of the bistoury the tendon of the extensor carpi ulnaris, and afterwards the various fibrous bundles of the articulation; he would then move the bone backwards and forwards in order to luxate it; glide the bistoury flatwise upon its radial surface, then isolate it to near the anterior articulation, and separate it from the first phalanx of the little finger while carefully avoiding the extensor and flexor tendons of this last mentioned appendage. Liston's pliers should also be used here as with the first metacarpal bone.

### § V.

The dangers of the operation, also, in whatever way it may be performed, are the same as those from amputation, and M. Fleury (*Journ. des Conn. Méd-Chir.*, 1838, p. 249) mentions a case which, after he had exsected the anterior half of the second metacarpal bone, terminated fatally by purulent infection.

### ARTICLE II.—THE WRIST.

Others besides Moreau, M. Roux, and M. Hublier (*Bull. de Férussac*, t. XVII., p. 400) have excised the carpal extremity of the fore-arm. According to M. Bobe, this operation was performed with perfect success about the year 1800, by M. Clémot of Rochefort, or rather by M. Saint-Hilaire, (*Os de l'Avant-Bras, Thèse*, Montpellier, 1814, p. 10,) on a patient in whom the radius and ulna having been luxated, protruded to considerable extent through the lacerated soft parts. Cooper (*Lassus, trad. de Park*, p. 7) had been no less fortunate half a century before. The attempt of M. Hublier also succeeded completely, and it to be enumerated under the same head. There was in this case dislocation of the hand, laceration of the integuments, and protrusion of the bones externally. The extensor and flexor tendons, not being wounded, the surgeon resolved to remove the exposed portions of the radius and ulna, after having properly isolated them; the hand and fore-arm were then replaced in their natural position, and after the cure, which was attended with no untoward accident, the movements of the fingers could be executed with almost as much facility as before.

We undoubtedly ought not to hesitate in such cases, should the reduction of the bones be impossible, or be attended with too much difficulty; but there is another kind of exsection whose utility is not so well demonstrated; I mean that, for example, which relates to organic lesions, more or less ancient, caries, necrosis, or osteo-sarcoma. These diseases, in fact, are rarely sufficiently serious at the wrist as to require an operation of this kind, without there being present also at the same time, a profound alteration of the bones of the carpus and of the soft parts which surround them. How then can the operative process be submitted to rules that are in any respect precise?

Nevertheless it is an operation which many surgeons have made trial of. M. Malagodi (*Journ. des Conn. Méd.*, t. II., p. 201) who ascribes cases of this kind to MM. Withusen, Cittadini, Warmuth, and Holscher, appears in this matter to have mistaken one articulation for another.

As to what regards himself, he has in this manner removed the ulna, the styloid process included, as high up nearly as the coronoid process, and his patient who recovered could afterwards use his hand as well as he could before the disease existed. The lower extremity of the ulna also appears to have been excised successfully by M. Jæger, (*Heine, Gaz. Méd.*, 1834, p. 645.)

"The *coude* or ulna, says M. A. Séverin, (*Méd. Efficace*, § 954. This case, says M. Velpeau, could be claimed as well almost for a fracture as for a luxation,) which was dislocated inwards from the wrist, and which was fractured, not yielding to reduction, in spite of the strength of three robust men, Master Blaise and myself sawed the ends of the bone which protruded, and the patient got well." M. Breschet (*Mém. sur les Luxat. du Poignet*, &c., par Malgaigne, p. 39, 1833) also appears to have excised an inch and a half of the ulna, which had been luxated inwards and protruded through the integuments. The carpal extremity of the radius was denuded, black, and dry, and had been luxated for six months in consequence of an abscess. The father of the child dividing the bone on a line with the soft parts, by means of the chisel and mallet, took off three inches of it, and two hours after detached two inches more, which constituted a part of the first portion. The patient can use a great portion of this hand, though its movements are feeble, (*Champion, Traité de la Résection des Os Cariés dans leur Continuité*, etc., p. 57; but the details of the extent of the necrosis, says M. Velpeau, are not given.) Orred (*Trans. Phil.*, t. LIX., part. 1ère, art. 2, 1779) speaks of a surgeon who excised three inches of a carious ulna, (probably necrosed, says M. Velpeau.) The patient was so well cured by the reproduction of the removed bone, that he continued to pursue his customary labors in the country. In a case cited by Bagieu, (*Examen de plus Part. de la Chir.*, t. II., p. 443, 440, obs. 7,) the head of the two bones was fractured by a ball; the splinters were immediately extracted; a shortening of more than an inch took place; the radio-carpal union became ankylosed; nevertheless a sufficient degree of flexibility was preserved to the fingers to write and design almost as well as before the wound. This operation was performed by Moreau the father, in July, 1794, for a necrosis caused by an acute inflammation, on J. P. Husson, a notary seventy-one years of age, who had already lost his left hand, and who died on the 29th of the same month, from exhaustion consequent upon the intensity of the primitive inflammation. Another patient of Moreau recovered perfectly. One of the two operated upon by M. Roux died, the radius only having been excised.

[Mr. Fergusson has described in the last edition of his *Practical Surgery* (1842) a case in which he performed the excision of the whole of the carpus with the contiguous articulations. Longitudinal incisions were made along the radial and ulnar sides of the wrist, by which he was enabled to remove about half an inch of the radius, the same extent of the ulna, and the two rows of the carpal bones. The upper ends of the metacarpal bones, were also removed, with the exception of that of the thumb, which was sound throughout. All the extensor and flexor tendons of the fingers were preserved as were the radial and ulnar arteries, with the median and ulnar nerves. Some three or four months af-



terwards, the original strumous openings had not healed, there was considerable swelling and the hand and forearm were as useless as before the operation. "Judging from this case," he remarks, "I should not be disposed to speak favourably of such a proceeding, but it is probably too early to give an opinion, and it must be borne in mind that in the elbow-joint, and some other instances, where resection has been remarkably successful, a much longer time has elapsed, ere all the external orifices have been closed.—A hand with a stiff wrist is decidedly better than no hand at all. On this point we have ample experience in the instances of ankylosis in this locality, which often come under our notice, and also in those cases where artificial substitutes are used in lieu of the hand which has been amputated." (p. 298).

In December, 1853, we witnessed at the Bellevue Hospital, a partial exsection of the carpus, by Dr. Sayre. Dr. S. proposed to remove both row of bones, but was dissuaded by the other surgeons of the institution, and to this circumstance he attributes his failure, amputation having been at length required. In the *Lond. Med. Times and Gazette*, Nov. 1853, it is stated that Mr. Fergusson in October repeated this operation, and that it has likewise been performed by Mr. Erichsen, of University College Hospital. In the same Journal for February, 1854, it is mentioned that both of these patients had been discharged, with the wounds nearly healed, but sufficient time had not elapsed to judge of the utility remaining to the limb. Mr. Simon, of St. Thomas' Hospital, operated in Oct. 1852, but the wound had not cicatrized at the end of a year, when the patient was seized with fever and died. For the details of these cases, see *N. Y. Journ. of Medicine*, May, 1854. p. 443. The wrist has also been excised by M. Maisonneuve, of Paris, and by Dr. Carnochan. Prof. Pancoast has removed the upper row of bones. G. C. B.

Upon the supposition that exsection of the wrist may become necessary, there are two or three methods which might be adopted, and which have been made trial of.

### § I.—*Process of the Author.*

An incision on each border of the fore-arm, one from the root of the thumb, the other from the last metacarpal bone, to extend to two inches above the styloid processes of the radius and ulna, and to be united by a transverse incision on the posterior surface of the fore-arm, would enable us to reverse from above downwards a flap upon the back of the hand, whereby the entire dorsal surface of the articulation would be laid bare. I then proceed immediately to the disarticulation. The tissues on the anterior surface are then detached from the bones, and protected by a thin piece of flexible wood, sheet-lead, or pasteboard. This being done, we divide, with the same cut of the saw, both the radius and ulna, above the seat of the disease. The flap preserved is united to the opposite lips of the wound by a few points of suture. A gentle pressure approximates its anterior surface to the bottom of the wound, and it is not impossible that the extensor tendons may ultimately re-acquire their action upon the fingers.

By this process, the operation is performed with great ease upon the dead body, and we may avoid, without difficulty, the radial and ulnar

arteries, while detaching the tissues from the anterior surface of the wrist.

## II.—*Process of M. Dubled.*

M. Dubled, having made his first incision on the inside, after the manner of Jeffray, dissects the lips of the wound from the posterior surface, and then from the anterior surface of the ulna; causes them to be drawn to the outside; divides the lateral ligament, places the hand in the position of abduction; completely isolates the head of the bone; makes it project as much as possible outwardly; detaches it from the radius; passes between it and the latter a piece of sheet-lead or wood; and then with the saw, cuts above the seat of the disease, through the whole thickness of the affected bone. The same process is then applied to the outer border of the articulation; and as the ulna has already been excised, it is then more easy to turn the hand inwards and to throw the radius outwards, and thus effect its excision. By this process, all the tendons would be saved, and the consequences of the operation evidently more simple. In repeating it on the dead body, I have found it of very easy execution; but it is not probable that it would be equally so on living man, and on a deformed hand.

## § III.—*Process of Moreau.*

The operative manual adopted by MM. Moreau, Roux, and Syme, while it is not much more complicated than that of M. Dubled, has however the advantage of rendering the excision of the articular heads infinitely more easy. A transverse incision, which commences at the carpal extremity of each lateral incision, and which is prolonged from eight to twelve lines upon the dorsal surface of the wrist, circumscribes two little flaps, in form of an L, on the posterior region of the radius and ulna. These are dissected and raised up, one after the other, commencing with that of the ulna. After having pushed aside, detached, and isolated the tendons, we endeavor, by means of a spatula, to insinuate a protecting compress between the two bones, and which is to be brought out from the inter-osseal space, so as to come between the palmar surface of the ulna and the soft parts. An assistant immediately seizes it, and draws its two extremities towards the radius, in order that the tissues may be also thus drawn in the same direction. With one cut of the saw, the surgeon then effects the section of the bone, which he afterwards detaches, by means of the bistoury, from the carpus and radius. He then immediately proceeds to the dissection of the second flap, also to that of the great number of tendons on this side, and the radial artery. To terminate, he has only to repeat on the radius what he has just done on the ulna. The patient thus operated upon by Moreau recovered. The case, however, has not been given with sufficient details to determine the precise value of the fact to which it relates. The patient of M. Roux (Dubourg, *Journ. Univers. Hebdom.*, t. II., p. 358) was doing admirably well on the fifteenth day after the operation; but was afterwards obliged, it is said, to undergo amputation.

If only one of the bones should be diseased, we should, it may be

readily understood, confine ourselves to a single flap and single wound. If the head of the ulna only was to be exsected, the simple incision of M. Dubled and M. Liston's sector (*sécateur*) would be sufficient. The process, however, indicated under the head of *Exsection of the Body of the Bones*, would become indispensable, if, as in the case of M. Malagodi, the diseased portion of the ulna or radius extended very high up. The vertical rowel saws, moreover, and the osteotome of M. Heine, would, at the present day, render the operation more easy, by enabling us more conveniently to avoid the soft parts. By means of the concave rowel saw, as has been mentioned above in speaking of the malleoli, we might in fact, and indeed should, where a portion of the head of the radius only is diseased, exsect it without opening into the joint. The process, however, which I have described in the beginning, is the easiest of all; this of itself would enable us to excise, at the same stroke, the head of the bones of the carpus, if that was diseased. The facts stated under the chapter on *Deformities*, (see Vol. I.,) authorize us, at the present day, to indulge in the belief that the transverse incision of which I have spoken would not destroy the action of the extensor tendons of the fingers.

### ARTICLE III.—THE ELBOW.

Exsection of the elbow joint, first successfully performed by Wainman, (*Jeffray, Opér. cit.*, p. 10,) who, however, removed only the trochlea of the humerus for a luxation of the elbow; suggested, in 1781, by Park, with the view of applying it to chronic diseases; performed on living man, in 1782, by Moreau, and a little later by Percy (Morcau, *Résect. des Os*, p. 57,) and many other military surgeons; has been made trial of six times by M. Roux, twice by M. Crampton, fourteen times by M. Syme, and once by M. Spence. Since these first essays MM. Moreau, father and son, MM. Champion, (*Ibid.*, p. 57; *Journal de Corvisart*, Mars, 1813; *Bull. de la Fac.* t. III., p. 20,) Mazzosa, (*Journ. des Conn. Med.*, t. II., p. 201,) Jæger, Textor, Moisisowitz, (Heine, *Gaz. Med.*, 1834, p. 465,) Delpech, Dietz, Kern, Sanson, (Coulon, *Op. Cit.*, p. 45,) and others, have related new and sufficiently numerous examples of it.

#### § I.—*Process of Park.*

Park thought it sufficient to restrict himself to an incision parallel to the axis of the limb, and extended to two inches above and below the olecranon. The two lips of this wound being held apart, he endeavored to divide the lateral ligaments and the tendon of the triceps muscle, and to luxate the extremity of the humerus backwards; but experiencing too great difficulty, he first exsected the olecranon, and then attained his object with greater facility. This first stage of the operation being finished, Park effected the excision of the humerus about two inches above the articulation, on a piece of wood or metallic plate inserted between the anterior surface of the bone and the tissues. The lips of the wound were approximated in such a manner as to be kept in contact by means of strips of adhesive plaster.



In his letter to Pott, this surgeon admits that this process probably would not answer for a diseased and tumefied articulation; that in that case it would be necessary, 1st, to make a transverse incision, which should be placed immediately above the joint; 2, to dissect the four flaps which should be performed by it; 3, to lay bare in this manner the whole posterior surface of the bone; 4, then to remove in succession with the saw the inferior extremity of the humerus, and the upper portion of the bones of the fore-arm. Such a method cannot be strictly applicable to any case, any more in its primitive simplicity than associated with the crucial incision, though something analogous was in one case employed with success by M. Syme.

### § II.—*Process of Moreau.*

In place of dividing upon the median line, Moreau commences by setting out from the condyles, and making his incisions on the borders of the humerus, dividing from below upwards the whole thickness of the tissues, to the extent of two or three inches. A third incision placed transversely, unites the two first immediately above the olecranon, which thus enables us to form a quadrilateral flap, which is dissected and raised up on the posterior surface of the arm. The bistoury inserted flat-wise upon the anterior surface of the humerus, is then made to detach the tissues carefully from this part. A flat piece of flexible wood is then immediately after introduced in the place of the instrument, and the remainder of the operation performed as in the process of Park. If the extremity of the ulna and radius are to be removed, all that is requisite is to prolong the lateral incisions a little lower down, and to form, in this manner, a small lower flap, which being dissected, renders the section of the bones which it covered a very easy matter.

### § III.—*Process of Dupuytren.*

The process of Moreau is the one that should be adopted, and which MM. Roux and Syme at least have followed in most of their cases. It has been deemed necessary, however, to modify their process in some respects. Thus Dupuytren has shown that the ulnar nerve, which they almost unavoidably sacrifice, may and ought to be saved. After having cut out a quadrilateral flap, and laid bare the upper extremity of the ulna in the manner of Park, Dupuytren begins by excising the olecranon, and then cautiously divides the sheath which contains the ulnar nerve behind the inner condyle, then pushes this cord inwards, and causes it to pass in front of the articulation, where an assistant retains it by means of a curved sound, the handle of a scalpel or even the finger, until the lower extremity of the humerus is removed.

### § IV.—*Process of Jeffray.*

Jeffray (*Oper. cit.*, p. 174) having devised his chain-saw, supposed that two lateral incisions would be sufficient, and that the crucial incision of Park, and the transverse incision of Moreau, were useless. His chain-saw requiring only a slit on each side in order to be passed around

the bone, enabled him thus to preserve the continuity of the muscles and tendons uninterrupted, and to save the ulnar nerve, a crowning perfection being thus given to the operation which bore off the honors from Dupuytren.

### § V.

*Process of Manne, (Traité Elém. des Malad. des Os, p. 50, 1789.)*—A semicircular incision was first made at the postero-inferior part of the arm; a similar one at the postero-superior part of the fore-arm; then two longitudinal incisions were made, which extended from the extremities of the superior semicircular incision to those of the inferior; *the flap comprised between these incisions was then removed, [i. e., detached. T.]*; the tissues were then carefully detached from the anterior and inner surface of the articulation; the periosteum was divided circularly around the bones; the tissues were then held aside with a bandage, and the bones sawed above and below the articulation; the lips of the wound were brought together, covered with lint, and the whole supported by an eighteen-tailed bandage, the arm and fore-arm being placed in a gutter or in fanons, (see Vol. I.) upon a pillow.

M. Sédillot, adhering to the two semilunar incisions, eulogizes the process of Manne, as the one which is still the best.

### § VI.—*Process of the Author.*

A. The patient is to be placed upon his belly or upon his sound side. An assistant compresses the brachial artery, and supports the soft parts of the arm. Another holds the fore-arm. The surgeon placed outside, with a straight bistoury, makes his first incision two inches long on the outer border of the humerus, beginning or terminating it at the outer condyle, and prolonging it upwards in such manner as to separate the brachialis internus muscle from the outer portion of the triceps. A second incision is then made on the inner border of the arm, in such manner that, in order to avoid touching the ulnar nerve, its lower extremity may fall rather upon the side of the olecranon than upon the inner condyle. After having united these two first wounds by a transverse incision, which divides at the same time the tendon of the triceps, the flap is dissected and raised up with facility. An assistant then seizes hold of it, and if the extremity of the bones of the fore-arm appears sound, we proceed immediately to the exsection of the humerus. In the contrary case, we must prolong the lateral incisions downwards, and form a lower flap similar to the first.

B. *Second Stage.*—As soon as the cubital nerve is laid bare, we isolate it from the bridles which hold it down between the internal condyle and the olecranon, and then while the fore-arm is placed in as strong extension as possible, we slip it, as has been just said, over the inner tuberosity of the humerus. Then the operator draws forward the undivided tissues, and slightly flexes the limb; detaches with the point of the bistoury the muscular tissues from the anterior surface of the bone, passes in front of the humerus the plate of wood, puts the saw in motion, embraces the upper extremity of the fragment of bone, which he wishes to remove, separates all the tissues from it, in proportion as he

reverses it from before backwards, and from above downwards, and then divides the anterior, external lateral, and posterior ligaments.

C. *Third Stage*.—If the ulna and radius are to be exsected, the surgeon detaches to a point below the disease the insertion of the brachialis internus muscle, as well as that of the biceps, and terminates by dividing the bones with the saw, directed from before backwards, or from behind forwards, according as the state of the parts may seem to require or render more convenient. In this case it is better also not to disarticulate the humerus, and proceed afterwards to the section of radius and ulna. If the bones of the fore-arm are perfectly sound, it is difficult to conceive that the excision of the olecranon can be of any service. When they are diseased, the operation is necessarily longer and more serious, and as it appears to me would present but slight chances of success, should it become necessary to make the excision below the olecranon tuberosity of the radius, since we should then destroy the attachment of the two principal flexor muscles of the limb. The brachial artery being separated from the humerus by a thick muscle, is never difficult to be avoided. It would incur much more risk, if we were obliged to descend upon the fore-arm as far down as on a line with its bifurcation. It is a matter of great importance that we should make the section of the ulna and radius above the insertion of the brachialis internus muscle, and especially that of the biceps. M. Syme, however, as it appears, performed excision below the tendon of these muscles, in some of his patients, who nevertheless preserved the functions of their hand.

D. *Fourth Stage*.—After having removed the bones, tied the vessels, cleansed and adjusted the wound, and ascertained that we have left no portion of disease behind, the fore-arm is to be brought into extension; the two flaps are to be brought together, united by two or three points of suture, and to be adjusted in the same manner at their edges to the anterior soft parts. [*At present* all tension of this kind by sutures, adhesive straps or even loose bandaging, or any pressure whatever, are, it would appear, by general consent to be rigidly proscribed. See note supra, under *Amputations*. The starch bandage would be particularly objectionable. T.] Gateaux of lint, a few graduated compresses, the bandage of Scultetus, cushions and two thin splints, or the *starch bandage*, [appareil inamovible—see note, a few lines above, T.] would maintain the surfaces in contact, and the totality of the limb in a complete state of immobility. [This practice of immovability or immobility of the limb must be surrendered also with its accompaniments or congeners, (vid. notes above,) as it is all at war with the present most approved principles of treating wounds of joints, where the joints are exposed, whether such wounds are traumatic or surgical. The favorite starch bandage of our author, with every deference to him, must, we think, be confined to simple fractures, and then, only to be used where there is no inflammation, or where it has entirely subsided. The articulations, when laid bare and lacerated, or fractured or luxated, or afterwards exsected, or where all these conditions exist together, must, it is now ascertained, be treated in the most gentle manner with light, soft dressings, and their flaps merely brought together; besides which, a slight degree of motion must in some way be kept up from the first. See our note supra. T.]



§ VII.—*Appreciation.*

The exsection of the elbow-joint, is a tedious, long and painful operation. It is rare that it is followed by perfect, immediate union. An abundant suppuration is frequently the result. One of M. Roux's patients was not perfectly cured until at the expiration of nearly a year. It cannot be had recourse to except in cases where the skin and a part of the muscles retain their natural state, or for a caries or simple necrosis, or a comminuted fracture of the articulation. All these circumstances have been calculated to intimidate practitioners, and have rendered the operation we are treating of more rare than would have been at first supposed. Nevertheless, it has constantly succeeded with the surgeons of Bar, M. Roux, also, has had three fortunate results. His first patient, operated upon in 1819, recovered from the operation, but died of phthisis five months after. The second, became a knife-grinder, on one of the bridges of Paris. The third patient, and whom I saw operated upon, resumed her profession of seamstress, and afterwards that of chambermaid. A fourth case, in whom a sudden hemorrhage rendered it necessary to proceed to immediate amputation of the arm, died three days after. Two others succumbed to the consequences of the operation. The patient of M. Mazzoza, recovered. That of M. Crampton, operated upon January 2d, 1823, himself signed his discharge on the 29th of November following. Out of the fourteen operated upon by M. Syme, from October the 1st, 1828, to October the 1st, 1830, two have died. A third, had afterwards to undergo amputation of the arm. Eleven recovered perfectly, some by almost immediate union, others after a greater or less length of time, and all have preserved, in great part, the uses of their limb. M. Syme, (Coulon, *Op. cit.*, p. 45,) was less fortunate in another case in 1831; but that of M. Spence, operated upon in 1830, also recovered perfectly.

[At a meeting of the Pathological Society of London, May 2, 1854, Mr. Fergusson stated that death had occurred twice in his practice, from the shock following excision of the elbow-joint. G. C. B.]

In uniting to these facts, the two successful cases which belong to Wainman and Park, (Jeffray, *Op. cit.*, p. 68,) that of Justamond, (*Ibid.*, p. 55,) who removed the olecranon and two inches of the ulna, that of M. Harris, (*Gaz. Méd.*, 1837, p. 585,) whose patient recovered the use of his elbow-joint, that of M. Warren, (communicated by the author, 1837,) which ended in death, the successful case of M. Davidson, (*Edinburgh Periodical and Surgical Journal*, Vol. LVIII., *Expér.*, t. II., p. 104,) then the four cases of M. Fricke, (Godin, *Arch. Gén.*, 1837, t. XV., p. 187, 191,) and those which were collected by M. Sprengler, in 1836, 1837 and 1838, from the practice of M. Textor, we have, in admitting all those also mentioned by M. Coulon, (*Op. cit.*, p. 45,) an aggregate of about *sixty cases* of exsection of the elbow-joint, yielding more than *forty cures*, arranged as follows:—

*In the cases complicated with Luxations or Fractures.*

Wainman,	1.	} Resulting fortunately.
Goorke,	1.	
Perey,—several.		
Dinus and Mazzoza,	1.	
Hey,	2.	
Evans,	1.	} Doubtful.
Textor,	1.	
Warmuth,	1.	

*In the cases of Caries.*

Justamond,	1.	Jäger,	2.
Moreau, the father,	4.	Dietz,	1.
Moreau, the son,	1.	Kern,	1.
Champion,	1.	Moisisowitz,	1.
Dupuytren,	2.	Sanson,	1.
Park,	1.	Harris,	1.
Crampton,	2.	Warren,	1.—dead.
Delpech,	1.	Davidson,	1.
Roux,	6.—4 dead.	Fricke,	5.—1 dead.
Syme,	15.—5 dead.	Textor,	7.—4 dead.

[In the discussion which followed the reading of a paper by Mr. Mackenzie, before the Edinburgh Medico-Chirurgical Society, on excisions of the knee-joint, Mr. Syme remarked that he had performed the operation of excising the elbow-joint in nearly a hundred instances, and that his experience had shown that “many months, or years, or even a whole life time, might elapse before the wound was so completely consolidated as not to suffer occasionally from small collections of matter in and about the cicatrix, which interfered little with the patient’s comfort, as they did not affect the usefulness of the hand or the strength of the arm, but would entirely unfit the inferior extremity from being employed as a support of the body.” (*Month. Journal*, July, 1853, or *Braithwaite’s Retrospect*, Part XXVIII. p. 153.) Mr. Erichsen states (*Science and Art of Surgery*, p. 614,) that a coachman, whose elbow-joint he excised, was afterwards able to drive, to lift a pail of water, and to do all the duties of his employment nearly as well as if the arm had been left in its normal condition. In another case in which he performed this operation, the patient died of pyæmia, and after death the interior of the humerus was found to be filled with pus, and the axillary vein in a state of suppuration. (*Op. cit.* p. 571.) Mr. Fergusson has also had some very successful cases of this operation as may be seen by the illustrations in his *Practical Surgery*. Dr. Thomas Harris was the first to perform it in this country, and it has since been frequently repeated by Drs. Buck, Pancoast, Warren and Mutter. G. C. B.]

So that it is impossible not to admit this operation at the present day, as among the number of the most valuable acquisitions of surgery, notwithstanding the contrary opinion of M. Larrey and my ancient precep-

tor M. Gouraud, who adopt it only in cases of fracture or comminuted luxation, with division of the integuments and protrusion, of the bones. It is true that the destroyed parts do not seem capable of reproduction, as some persons in the beginning flattered themselves was the fact, and it is also true that the articulation at the elbow is almost always wanting. But there is, nevertheless, formed in their place, a substance sufficiently solid to serve as a point d'appui for the muscles, and to enable the fore-arm to make flexion and extension. The patients once cured, have always been enabled to make use of their hand, and have, as we have seen, deemed themselves exceedingly fortunate in not being obliged to undergo amputation of the arm, the only resource which would have been left them if exsection should not or could not have been attempted. The loss of substance also may be made to a great extent. Brun (*Mém. de l'Acad. des Sc. de Toulouse*, t. II., p. 38, 1784,) mentions a gunshot wound at the articulation of the elbow, which carried away the lower half of the humerus and the upper half of the two bones of the forearm to the extent of *fourteen inches and a quarter* in the whole extent. The patient, who recovered with an interval of fifteen lines between the fragments, can make use, says the author, of his wrist, with which he raises a weight of forty pounds; but he cannot raise his hand to his head, except by sudden jerks, and by means of a vigorous contraction of the muscles which cover the shoulder: when the lower part of the arm has been carried up in this manner, his fingers act voluntarily.

[Professor Syme states (*Supplement to his Principles of Surgery*, Edinburgh, 1851, p. 29) that he has extended excision of the elbow-joint to the remedying of ankylosis. If the Edinburgh professor will but turn to the *North American Medical and Surgical Journal*, for April 1827, he will find that Dr. J. Rhea Barton had anticipated him in this matter and had given the following diagrams illustrating the method to be adopted according as the arm is in the flexed or straight position.

Fig. 1.

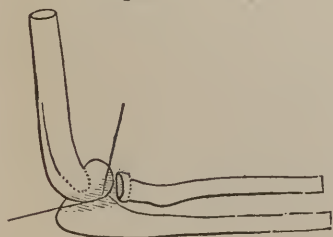
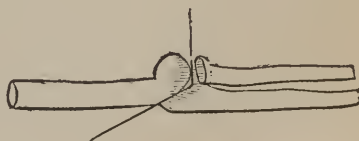


Fig. 2.



The line in Fig. 1. represents the direction in which the bones might be divided, by a long and narrow saw, in cases where the elbow joint is ankylosed at a right angle. The line in Fig. 2. the direction of the section, when in a straight position. Prof. Syme remarks that the operation in these cases is much more difficult than when performed for caries, and requires a very free ablation of the bone. When properly executed, he asserts, it renders the limb nearly perfect, in regard to motion and strength.

Dr. Barton, also, suggested the extension of this principle to the



formation of new joints in other parts of the body where natural motion has been lost, for ankylosis, the muscles being in a sound state.

G. C. B. ]

#### ARTICLE IV.—PARTIAL EXSECTION OF THE ELBOW-JOINT

##### § I.

If *one of the condyles* only or the olecranon was the seat of the disease, we should pursue the same plan which Moreau did on one occasion with success; that is, to make one of the lateral incisions above described; then to make from the lower extremity of the last mentioned, another incision transversely, which is to terminate above the olecranon about the middle of the breadth of the arm; to dissect and reverse from below upwards, to the median line of the limb, the triangular flap thus circumscribed; then by means of the chisel or gouge to destroy every portion of the bone which is diseased, and afterwards to adjust the flap in its place to unite by first intention. This partial excision which has been performed also by M. Fricke, and which I have made trial of on one occasion, would now require that we should detach the bone by means of the concave rowel saws, the osteotome of M. Heine, or the cutting pliers, should seem possible to respect the articulation, as in my case related a little farther back, (in this volume II.)

##### § II.

The *Radius* only. A gun-shot wound which happened in the year 1777, fractured the upper part of the radius; at the expiration of five weeks, inflammatory accidents supervened; the fractured portion is considered as a foreign body; *an erysipelatous state of the limb, and acute pains about the fracture, &c., lead to the proposition of amputation.* Salmon and La Flize, (Salmon, *De Artium Amputat. rarius admittenda*, § VIII., Nanceii, 1777,) oppose it, and the first named of these surgeons, detaches and removes the isolated portion of the radius, which was two inches in length. A cure was effected.

In 1796, says M. Champion, (Unpublished—Communicated by M. Champion,) I saw a surgeon of the most ordinary kind, remove an inch and a half from the humeral extremity of the radius, which had been wounded, and laid bare by a sabre cut, without implicating the articulation. The patient preserved the movements of flexion and extension, but rotation was imperfect; he was enabled however to continue his profession of gendarme.

##### § III.

The *Ulna* alone. A sequestrum of the olecranon was removed by means of the fingers by Le Dran, (*Obs. de Chir.*, t. I., p. 356; *Obs.* 51, 1731,) without the articulation being thereby injured. But a case in which Alanson, (Park, *Nouv. Meth. de traiter les Maladies*, p. 54,) removed a similar fragment, including the inner tuberosity, and a lamina of the body of the humerus, was followed by ankylosis. Jalabert, (*Jour-*

*nal sur toutes les Parties de l'Art. de Guérir, &c.*, p. 91, 1792,) has seen a case in which destruction of this eminence by caries was not followed by any inconveniences. In a patient of Ravaton, (*Chir. d'Armee*, Obs., 66, p. 294,) the olecranon was carried away by a gunshot wound. In that of Planque, (*Mém. de l'Acad. de Chir.*, t. II., p. 528, in 4to, t. VI., p. 241, in 12mo,) a portion of the external condyle of the humerus was carried away at the same time. Although in the case of De la Touche, (*Dissert. sur l'Amput.*, p. 56 ; Obs. 15, 1814,) there had been a simultaneous fracture of the two bones of the fore-arm, pronation and supination continued unimpaired, in spite of ankylosis of the elbow. In another case, the upper half of the olecranon was carried away by a sabre cut, and M. Larrey, (*Séance de la Sect. de Chir. de l'Acad. de Méd.*, 30th Sept. 1824,) as well as M. Baudens, (*Clinique des Plaies d'Armes-à-feu*, p. 452,) speak of olecranons fractured, and extracted without being followed by ankylosis.

The *olecranon* was exsected in a case of luxation of the elbow-joint backwards, rendered irreducible by the protrusion of this process through the skin. B. Bell, (*Cours Complet de Chirurgie*, t. VI., p. 141,) who was witness of the operation, is of opinion, that if the fore-arm had been flexed instead of being extended during the efforts at reduction, that the displacement could have been reduced, and the operation avoided. In a case of gun-shot wound, Bilguer, (*Dissert. sur l'Inutilité de l'Amput. des Membres*, § 36, p. 122,) extracted splinters, and exsected the ulna to the extent of four fingers' breadth, removing at the same time pieces of iron which were buried in the parts, and cured his patient. [An interesting case of this kind occurred near this city, a few years since. A gentleman while out shooting, had his gun burst, and the fragments produced a lacerated wound near the bend of the arm. The country physician continued for months, in fact for near a year, to extract from the wound fragments of every description, bits of the coat sleeve, pieces of the wooden stock, barrel, &c.; never attempting to dilate the wound and look into the real condition of the mischief. The arm meanwhile was comparatively useless and rapidly withered. The patient came to town. Dr. Cheesman, a good operator, but one of those who rarely condescends to inform the world of the fruits of his experience, nevertheless did well here so far as regards the treatment. He cut down and freely dilated the wound, and discovered two or three inches of a fragment of the gun barrel, which completely embraced the round anterior portion of the radius, we believe, fastened upon it like an outward semi-cylindrical encasement. This being detached, the patient recovered perfectly. T.] According to M. Jæger, (*Jæger, Op. cit.*, p. 6, No. 36.) Gorke, exsected the olecranon and four inches of the ulna in the year 1793. In the case of Justamond, (*Ancien Journ. de Méd.*, t. LXXXIV., p. 402, 1790. Jæger, says, M. Velpeau, in stating that Justamond had removed the upper portion of the radius, is evidently mistaken. The same case is mentioned in Park, edit. of Jeffray, p. 55, 56,) the body of the humerus not having been implicated, the articulation was not exsected, but only the extremity of one of the bones of which it is composed ; extension and flexion were nearly destroyed, but rotation continued unimpaired.

[On the 18th of April, 1852, Dr. Compton, of the Charity Hospital, New Orleans, removed the entire ulna, and all but a portion of the lower end of the radius. The following report of the case, was made by A. Thibault, a student in the Charity Hospital, and was published in the *New Orleans Monthly Medical Register*, November 1st., 1852, p. 16.]

*Charity Hospital, Oct. 22d, 1852.*

"Thomas Harris, æt. 15, admitted during the month of February, for a lacerated wound of scalp and ear; fracture of inferior maxillary and humerus; compound comminuted fracture of radius and ulna. These injuries were received on board the English ship, Manchester. It appears that the boy was sleeping on the anchor chain; and that the anchor was suddenly let down; in its progress, the chain caught the arm and produced the injuries above mentioned. When the boy was admitted, the wounds had been dressed for several days, and from want of proper attendance and care, were in a very filthy condition. The arm especially, was in a sloughing state, and both radius and ulna were actually shattered to pieces, and protruding several inches out of the mass of muscles. By the 18th of April, the boy being well of all the other injuries, Dr. Compton determined to remove both the radius and ulna. He made a straight incision the whole length of the inner side of the radius, and a counter-opening opposite the olecranon process. Having dissected out both bones carefully and disarticulated them at the elbow, he removed them entire with the exception of a portion of the lower end of the radius. A great portion of the periosteum was detached from the bones, and left in the wound. The usual treatment for such operations was then followed and the patient improved rapidly, and the wound had nearly healed, when several abscesses were formed on the fore-arm. These abscesses were, according to Dr. C's opinion, produced by pieces of bones which had been left in the arm. His opinion was well grounded, for several spicula of bones came out of the wound and the arm immediately assumed a healthy condition, and is now well. The arm is about two or three inches shorter than the other, and is perfectly firm. It remains at a right angle to the humerus, and can be flexed and extended so that the hand moves through 8 or 10 degrees of an arc of a circle. He has entire use of the hand, he can both open and shut it, and he grasps objects quite firmly. The pulse in that arm can be felt as well as in the other. This patient can be seen in ward No. 8, and bed No. 116, Charity Hospital."

We have been thus particular in transcribing the details of this case, on account of its bearings upon the question of priority in removing the entire ulna, which as will soon appear, has recently been claimed by a surgeon of this city. Besides the case of Dr. Compton, we find in the *Phil. Journ. Med.*, and *Phys. Science*, vol. 1st. N. S. p. 115, 1825, that Dr. Butt, of Virginia, removed the lower two thirds of the ulna, and not of the radius, as is so frequently misstated by surgical writers. In three months the patient was enabled to pursue his usual avocation as a carpenter; flexion, extension, and rotation of the wrist being as free and uninterrupted as ever. He afterwards declared that he had as much strength in this hand (the left) as most people have in the right.

Dr. Carnochan has reported in the "*American Medical Monthly*,"



March, 1854, a case of removal of the entire ulna. Dr. C. erroneously supposes that his is the first operation of the kind. The affection was "ostitis, caries and necrosis." The operation was performed in January, 1854; and the following is his account of the proceeding adopted, with that of the appearances presented by the removed bone: "I made an incision along the posterior and inner aspect of the ulna, commencing at the lower part of its superior third and extending downwards to a point over the extremity of the styloid process. This divided the tegumentary layers and fascia, which were found dense, matted, and infiltrated. The tendon of the *extensor carpi ulnaris* was pulled back, and the bone exposed. This was found rough, enormously enlarged, and presenting numerous oval foramina and several cloacæ, which communicated externally through the integuments. It was now apparent that the bone must be disarticulated. To effect this at the carpo-ulnar articulation, a transverse incision, about an inch long, parting from the lower extremity of the first incision, was made across the back of the wrist. The superficial tissues were here reflected, and the tendon of the *extensor carpi ulnaris* was carefully detached from its groove on the lower part of the ulna. The dissection was now carried along the anterior surface of the lower portion of the ulna, and the soft parts were detached from the bone as far as the interosseous ligament, the ulnar artery and nerve being carefully avoided. The soft parts were now detached from the posterior surface of the ulna, avoiding injury to the extensor tendons. An attempt was then made to pass a chain-saw around the ulna through the interosseous space opposite the lower part of the middle third. This was found impossible, on account of the approximation of the enlarged ulna to the radius, and the almost complete obliteration of the interosseous space. To divide the bone at this point, a small convex-edged saw was used. The bone thus divided, the interosseous ligament was detached downwards, and the lower fragment of the ulna was disarticulated from its inferior attachments to the radius, fibro-cartilage and the carpus.

It now remained to isolate and detach the upper fragment. The first incision was now prolonged upwards along the posterior surface of the ulna, so as to end at the upper part of the olecranon, opposite its outer edge. To this a terminal incision was joined, which extended transversely across the back of the elbow-joint as far as the inner margin of the ulna. The soft tissues were now dissected from the bone upon its posterior and anterior aspects, as far as the interosseous ligament and as high up as the insertion of the *brachialis internus* muscle. The bone was next seized and pulled from the radius, and a knife, curved flatwise, was passed close upon its interosseal margin, and grazing the bone, the interosseal membrane was divided upwards, the soft parts being held apart, and the interosseal and ulnar arteries protected.

The elbow-joint was now flexed, and opened behind by entering the bistoury close to the inner edge of the olecranon, and the attachment of the triceps extensor was next divided by cutting directly outwards. The ulnar nerve was now found, and hooked aside until farther dissection of the soft tissues was effected from the inner aspect of the joint and the upper part of the bone. The lateral ligament was next divided. The bone still remained firmly attached, chiefly by the coronary

ligament and the insertion of the *brachialis anticus*. The ulna was carried backwards so as to make this muscle tense, and by carefully grazing the coronoid process with the knife the tendon was detached. Some difficulty was here presented in avoiding the humeral artery, which lay in close proximity to the enlarged coronoid process. The bistoury was now passed between the ulna and radius, and the coronary ligament divided. A few remaining fibres were divided, and the bone was completely detached.

During the operation there was a considerable flow of venous hemorrhage, which soon ceased upon removal of compression from the upper arm. The arterial bleeding was arrested by torsion of a few arteries around the elbow-joint.

*Progress of Union.*—After the operation, the patient recovered slowly from the influence of the chloroform, the pulse remaining below 50 for some hours; anodyne ordered at bed-time. Next day, Jan. 15th, the pulse 100—full and regular; oozing of blood has occurred to some extent; during the night, patient has been restless, and has suffered much pain in the arm. Sol. sulph. morph. at bed-time.

Jan. 16th. Pulse 100—not so full or strong; no more oozing of blood has occurred, and the patient feels more comfortable, having slept, and suffered but little during the night. The first dressing removed in the afternoon: for four inches above the wrist joint, the wound seems to be uniting by first intention.

Jan. 17th. Pulse 83—regular; general condition good. Ol. ricini ordered. The wound dressed; suppuration profuse. The lips of the wound have an unhealthy aspect; four of the sutures come away. Anodyne in the evening. The patient is ordered to commence in the morning with solution of sulphate of quinia.

Jan. 18th. Patient has slept badly, having suffered much pain, during the night, along the arm; pulse 80. Dressed the wound, which has assumed a better appearance; suppuration less, but little adhesion. Beef-tea ordered.

Jan. 19th. Pulse 90; patient has slept tolerably well. Wound dressed: discharge of pus decreasing, and union progressing from the wrist upwards; free discharge of synovial fluid from the elbow joint, upon removal of the dressing.

Jan. 20th. Pulse 84. Wound dressed; favorable progress. Full diet allowed. Quinine continued. No undue inflammatory action at either articulation. Arm still kept in the same position.

21st. Patient has suffered much pain at the elbow joint during the night. In the afternoon, wound dressed; doing well; there is free motion at both elbow and wrist joints; discharge of synovia still coming from the elbow joint.

Jan. 22d. Everything going on well. Wound dressed; but little discharge, except at the several tegumentary orifices which existed between the wrist and elbow before the removal of the bone; but little synovial fluid coming from the joint.

Jan. 25th. General condition of the patient excellent; pulse 80, and natural. Appetite good. Only slight oozing of synovia from the elbow; no pain. Splint upon which the arm rested in a state of pronation, dispensed with; forearm now bent at a right angle, and held in a position

between supination and pronation, while a light, well-padded splint, extending from the elbow to the extremity of the fingers, is placed and bandaged along the front thereof, to support the radius; limb, thus adjusted, supported by a sling passed around the neck. Patient allowed to sit up.

Jan. 29th. First splint removed, and the arm, which had been maintained fixed for the last four days, adjusted, and bandaged to another splint, jointed and formed of two pieces, one for the upper arm, and another for the forearm; the joint being opposite the elbow, in front: by this arrangement the forearm still kept in semi-pronation, and radius supported, while, by regulating the angle of the splint, by a mechanism for that purpose, the forearm can be gently and gradually extended.

Feb. 5th. During the use of both splints, dressings carefully attended to, by removal and re-adjustment at suitable intervals. To-day, upon removal of the splints and dressing, healing process of the wound found to be entirely completed; the tissues about the wrists and elbow joints being entirely consolidated, and free motion at both articulations possible by the patient himself, without any assistance.

Feb. 10th. Limb still supported by a light bandage, and by the last splint, for the purpose of allowing the tissues along the line of the inner aspect of the forearm to become further consolidated. Health of the patient is now good; he walks about like a well person, He is still upon tonic treatment, and is allowed generous diet.

Feb. 15th. Removed the splint; patient allowed to use his arm. General health entirely restored.

Feb. 18th. Five weeks after the operation discharged from the Hospital cured.

*Appearance of the Arm; and its Functions.*—With the exception of a depression, and the cicatrix along the ulnar aspect of the forearm, there is no deformity of the limb.

The functions of the arm are preserved in a remarkable degree of perfection. The power of prehension is unimpaired; and flexion and extension at both the elbow joint and at the wrist joint can be performed with facility—supination and pronation can also be effected—abduction and adduction at the wrist joint can be performed; as also flexion and extension of the fingers, as before the operation; sensation and nutrition are as perfect as on the arm and hand of the opposite side.

None of the large nerves or arteries were injured during the exsection of the bone, and the muscular tissue was carefully preserved from the action of the bistoury, with the exception of the cubital origin and insertion of those muscles which are attached to the upper portion of the ulna. These had to be divided during the detachment of this portion of the ulna.

Flexion at the elbow joint is chiefly effected by the *biceps flexor*, which is inserted into the tubercle of the radius; but the humeral origin of the other flexor muscles—such as the *flexor sublimis digitorum communis*, the *flexor carpi ulnaris*, the *palmaris longus*, the *flexor carpi radialis*, and the *pronator radii teres*—remaining uninjured, they also serve as auxiliaries in this function.

The *triceps extensor* and *anconæus* were, necessarily, entirely detached



during the operation ; but extension of the forearm is sufficiently performed by the action of the *extensores carpi radialis longus et brevis* ; by the *extensor communis digitorum*, the *extensor minimi digiti*, and by the *extensor carpi ulnaris* ; all of which muscles pass from the external condyle of the humerus, to be inserted on the posterior surface of different metacarpal and phalangeal bones of the hand.

Flexion of the wrist joint is effected by *flexor carpi radialis, palmaris longus, flexor carpi ulnaris* ; extension, by the *extensores carpi radialis* and the *extensor carpi ulnaris*. Adduction, also, is effected by the *extensor carpi ulnaris* ; while abduction results from the action of the *extensores carpi radialis*.

Flexion of the fingers is chiefly effected by the *flexor sublimis digitorum communis*, and the extending function of the phalanges results mainly from the action of the *extensor communis digitorum*.

*Pathological condition of the bone.*—The diseased ulna presents all the characteristic manifestations of prolonged inflammatory action of a high grade. The bone is enormously expanded from one extremity to the other—at the base of the coronoid process it measures in circumference  $5\frac{1}{2}$  inches ; and its weight is 8 oz., minus 20 grs., the weight of a recent healthy adult ulna varying from  $2\frac{1}{2}$  to 3 oz.

Bony vegetations have assumed the acicular form on the radial aspect of the bone, on a line with the attachment of the interosseous ligament, as far down as the junction of the middle with the lower third—the acicular formations also prevail on and below the coronoid process. At all other points around the upper extremity of the bone, irregular mammillated appearances exist, with innumerable enlarged, round, and oval foramina. These enlarged foramina, in conjunction with the hypertrophied condition of the bone, are characteristic signs of protracted inflammatory action, as was long ago demonstrated by the Goodsirs, of Edinburgh.

Along the inner and posterior aspect of the bone exist some eight *cloacæ*, five of which are in the upper third of the bone : two in the middle third ; and one near the styloid process. One of these *cloacæ*, situated between the coronoid and olecranon processes, communicates with the interior of the elbow joint ; while another, situated at the lower part of the bone, communicates with the ulno-carpal articulation.

The other *cloacæ* pass deeply into the interior of the bone, ramifying extensively, like sinuses, in different directions along the inner texture ; some of the sinuses containing portions of bone in a state of necrosis, and more or less detached. From the *cloacæ*, which opened externally upon the integumentary surface, large quantities of purulent fluid, mixed at times with portions of dead bone were discharged.

At the middle third, the circumference of the bone, by measurement, is four inches, being  $\frac{1}{2}$  in. larger than the shaft of an adult femur. At this part, also, the round and oval foramina are abundant.

The lower third of the bone is also extensively hypertrophied, being, at its upper part,  $3\frac{3}{4}$  inches, while, at the base of the styloid process, the circumference is  $2\frac{3}{4}$  inches.

The section of the bone, shows the appearance of the central portions. Here the influence of high inflammatory action, and its consequences, carious ulceration, necrosis, and eburnation, are plainly manifested. The

greater part of the interior of the bone is exceedingly dense and compact. The surface of the osseous section is in some parts tinted of a dark purple hue; at other parts it is whitish and dense, like ivory, blastema having been here thrown out so as to obliterate the spongy structure, the Haversian canals, the lacunæ, and canaliculi. The right lateral half of the section also shows the presence of two carious abscesses in the interior of the bone, which communicate externally with cloacæ and the integuments. In one of these abscesses a piece of sequestrum is situated, partly detached."

[Mr. Ewen, of Chester, Eng. has removed six inches of the ulna, and Mr. Fergusson states (*Pract. Surg.* 3d. Lond. Ed. p. 298) that he has repeatedly extirpated portions both of the radius and ulna. G. C. B.]

#### § IV.—*The Humerus alone.*

The removal of the lower extremity of the humerus, which had been isolated by a fracture, and was complicated with wound, was performed by Hey, (*Practical Observations in Surgery*, p. 365, case 7,) in 1801; and by M. Champion, (unpublished, communicated by the author,) in 1816. In this case, though the trochlea and internal tuberosity had been removed, the cure was complete, with a restoration of the movements of the limb; in a case of M. Larrey, (*Acad. Royal de Méd.*, 11 Sept. 1828,) in which a condyle of the humerus was separated by a sabre cut, he confined himself merely to its extraction. In another case in which Hey (*Opér. cit.*, p. 367, case 8) removed the extremity of the humerus, which had been fractured an inch above its articular portion, he also effected a cure. In another case, Park, (*Jeffray, Cases of the Excision, &c.*, 1806, p. 68,) after having exsected the upper fragment of the humerus, which had protruded through the skin, removed also the articular fragment of this bone and the apex of the olecranon. The motions of the limb were almost completely re-established. In a case of luxation in a child, the humerus, denuded of its periosteum, had protruded through the skin. Trye (*Ancien. Jour. Méd.*, t. LXXXIV., p. 403) removed two and a half inches of it, including also the condyles, and effected a perfect cure. In a similar case, in which M. Champion (unpublished, communicated by the author) excised the bone with the two lower thirds of the cavity of the olecranon, the movements were restored perfectly. In a case mentioned by Ansiaux, (*Clin. Chir.*, p. 320, 2e édit., 1829,) an eschar from a burn was torn off by a fall, and left exposed the entire articulation of the elbow-joint; the olecranon by itself came away on the fiftieth day. Everything indicated that the humerus would soon be detached; the suppuration became abundant, and the patient wasted away. Exsection of the humerus was performed at an inch and a half above its articular surface, on the sixtieth day after the accident; the patient recovered, but with a permanent flexion of the fore-arm, in consequence of the destruction of the tendon of the biceps from the burn; the movements of rotation however were sufficiently marked.

[In September, 1854, I was requested by my friends Drs. N. & A. Deyo, of Newburgh, to visit a lad who by a fall from a tree had suffered a compound dislocation of the elbow joint. The lower end of the hu-

merus protruded at the time of the accident, some four inches, and was reduced by the gentlemen above mentioned. The brachial artery was also ruptured. An attempt was made for several weeks to keep the lower end of the humerus in its proper place, but without success. As a substitute for amputation I removed about two inches of the protruding portion, including the whole articular extremity. Two months have elapsed since the operation and the articular cavity has become closed. An artificial joint has formed, and there can be no doubt that the boy will have a useful limb. We have recently seen another lad whose arm we saved several years since, after a compound dislocation at the elbow joint, complicated with rupture of the brachial artery. True ankylosis exists in this case, (the limb being in a flexed position) and perhaps it would have been better had I removed the lower end of the humerus, so as to have formed an artificial joint. In either case the result has been far more satisfactory than could have been produced by the most successful amputation. G. C. B.]

#### ARTICLE V.—THE SHOULDER.

In the year 1740, Thomas, a surgeon of Pézenas, published the case of a patient, in whom the head of a necrosed humerus had been successfully removed. A little later, Boucher, in his *Memoir on Wounds from Fire-arms*, demonstrated that the upper extremity of the humerus, shattered into splinters, might be removed without any very great difficulty, and without the patient being obliged to sacrifice his limb. The same doctrine was afterwards maintained by Percy, (*Eloge historique de Sabatier*, p. 813,) who exhibited nine cases of this exsection to Sabatier, and by M. Larrey, and almost all the surgeons of the army. On this subject, we may consult the thesis of M. Triaud, and that of M. Legrand.

As to those cases in which exsection was proposed by E. Platner, where the head of the humerus is the seat of an organic lesion, the operation has been performed by White, (*Cases in Surgery*, etc., 1770, p. 57,) David, Vigarous, (*Soc. Méd. d'Emulat.*, t. III., p. 396,) Moreau, the father, MM. Moreau, the son, (Moreau, 1803, 1816, p. 114,) C. Petit, Brulatour, Textor, (Coulon, *Op. cit.*, p. 43,) Wurtzer, (Coulon, p. 43,) Lassere, (*Arch. Gén. de Méd.*, 2e série, t. V., p. 156,) Buzairies, (*Journal des Connaiss. Méd.*, t. II., p. 109,) Reynard, (*Journ. des Progrès*, t. VII., p. 250,) Baudens, (*Clin. des. Plaies d'Armes-à-Feu*,) and others.

It is known, on the authority of Sabatier, that already, in 1789, a child exhibited to the Academy of Surgery, in his right hand, the scapular extremity of the humerus, of the same side which had been removed by the surgeon-major, of the regiment of Berry. The cases of this kind, either successful or unfortunate, are almost innumerable. An instance of the loss of the upper extremity of the humerus, carried away by a ball, is related by Seeliger, (*Biblioth. Chirurg. du Nord*, par Rougemont, t. I., p. 156.) The patient operated upon by Ride-wald and Camper, (Wachter, *De Articulis Extirpandis*, etc., p. 68, Groning, 1820,) in 1770, was amputated in order to cut off (pour aller au devant) the exhaustion caused by the suppuration, but neverthe-



less died. The head of the humerus, separated by a sabre cut, has been also extirpated by M. Larrey, (*Mém. de Chir. Milit.*, t. III., p. 27,) by Percy, (*Eloge de Sabatier*, p. 75, in 4to,) Chaussier, (*Mém. de la Soc. d'Emulat.*, p. 400, t. III., an VIII.,) by Roubieu, and another surgeon-major, (*Annal. Méd. de Montpellier*, p. 394, t. VIII.,) and by M. Yvan, (*Des Plaies d'Armes-à-Feu*, p. 17, 1805; *Thèse*, de Paris.) In the patient of Vigarous, (*Opusculs cités*, p. 106; (*Œuvr. Chir. Prat.*, p. 431,)\* in 1767, the same as in that of White, (*Trans. Phil.*, 1769, Vol. LIX., p. 39,) in 1769, the extraction of the dislocated head of the humerus became necessary, after the necrosed upper portion of the body of the bone had been excised. For examples of cases wherein fragments composing a portion of the head of this bone have been extracted and removed, we are indebted to Geoffroy, whose case, related by Boucher, (*Mem. de l'Acad. de Chir.*, t. II., p. 299, in 4to; t. XII., p. 300,) is always cited under the name of this last author; also to Ravaton, (*Le Chirurg. d'Armée*, p. 267,) and to Chabert, (*Obs. de Chir.*, p. 156, 1724; he was afraid to amputate, says M. Velpeau,) who published, in 1724, a remarkable case of this kind; to Nicolas, the son, (*Manuel du Jeune Chirurgien*, p. 425) to Bourienne, (*Journel de Méd. de Dehorne*, t. I., p. 206, 1782,) who removed at the same operation, and in succession, the pieces of bone which had composed the upper portion of the humerus, as far as the insertion of the deltoid muscle; to Massot, (*Ibid.*, t. III., p. 362,) who took away a large number of splinters, (csquilles;) to Percy, (*Eloge de Sabatier*, in 4to, p. 83, en note; to M. Larrey, (*Relat. Hist. et Chirurg.*, etc., p. 310; *Mem. de Chir. Milit.*, t. II., p. 171,) who gives ten cases of this kind; to M. Yvan, (*De l'Amp. des Membres à la suite des Plaies d'Armes-à-Feu*, p. 19, 1805;) and to M. Arbey, (*Coup-d'Œil sur l'Amput. des Membres*, etc., p. 13, Strasbourg, 1805,) who speaks of the immediate and successive extraction of fragments which had formed the upper third of the humerus.

Disarticulation, with the removal of the head of the fractured humerus and exsection of the body of this bone, have also been performed by M. Champion, (Unpublished—communicated by the author.) In another case his nephew, M. Nève, (*Ibid.*) excised a portion of the body of a fractured humerus, which had protruded through the skin, and become irreducible, and then disarticulated the head of the bone.

A case of exsection of the anterior half of the head of the humerus, notched by the passage of a ball, is also related by M. Baudens (*Clinique des Plaies d'Armes-à-feu*, p. 553, Paris, 1836;) and cases of the exsection of the head or of a portion of the body of the fractured humerus are also related by Grosbois (*Diss. sur l'Amput. du Bras dans l'Article*, p. 34, 1803,) Bottin, (*Hist. de l'Etat et des Progrès de la Chir. Milit.*, par Briot, p. 161, 1817,) Courville, (*Ibid.*) M. Willaume, (Jæger, *Op. cit.*, p. 3, Nos. 8 to 35,) and M. Guthrie, (Jæger, *id.*, No.

\* M. Vigarous, the son, says M. Velpeau, censures M. Champion for having said, (*Journ. de Méd. continué*, XXIII., p. 244,) that his father had not excised the head of the humerus, but only extracted it (*Œuvr. Chir.*, *cit.*, p. 431, 1812.) The evidence of this simple extraction, however, is contained in a paragraph in a letter from Vigarous, the father, to Sabatier (*Mém. de l'Institut. Sciences Phys. et Math.*) but which Vigarous, the son, was unacquainted with.

38,) and another English army surgeon, (*Ibid.*, No. 30.) A portion of the head of the humerus and of the clavicle and scapula were also removed by Morel, (*Medico-Chirurg. Trans.*, Vol. VII., p. 161;) but this case might be placed under the head of examples of caries resulting from comminuted fractures, and nothing shows that the cases of MM. Willaume, Guthrie and Textor, (*Jæger, Op. cit.*, p. 4, No. 47,) which last again performed this operation successfully in 1836, (Communicated by M. Sprengler, 1838,) belong to exsection rather than to extraction. In another case, related by M. Baudens, (*Clinique des Plaies d'Armes-à-feu*, p. 550, 1836,) where the head of the humerus was fractured by a ball which remained unextracted at the bottom of the perforation, exsection having been performed, the end of the body of the bone was rasped and rounded off, (*arrondi*,) as recommended by M. Reynaud.

The case of Porcet and Fayet is one of fracture from a fire-arm, with splinters and complete solution of continuity between the head and body, followed by a diffused callus uniting the two parts and accompanied with caries.

In cases of caries, exsection of the humerus has been performed by Lentin, (*Jæger, Op. cit.*, p. 3, No. 2,) Bent, (*Trans. Philosoph.*, Vol. LXIV., p. 353, 1774,) Orred, (*Ibid.*, Vol. LXIX., part 1, art. 2, p. 6, London, 1780, for the first case, and *Medical Commentaries*, &c., for the second; the operation in both cases was performed in 1779,) Moreau, the father, (*Obs. Prat. Relativ. à Res. des Art. aff. de Carie*, by Moreau, the son, p. 79, 1803, and *Essai sur la Résect. des Os*, etc., p. 10, by the same,) David, the father of Rouen, (*Inutilité de l'Amputat.*, etc., p. 55, Paris, 1830,) Porcet and Fayet, (*Briot, De l'Etat et des Progrès de la Chir. Milit. en France*, p. 164,) Rossi, (*Méd. Opér.*, t. II., p. 233, 1806,) Moreau, the son, (*Essai sur la Resection*, pp. 14, 16, 27,) Textor (*Jæger, Op. cit.*, p. 4, No. 5,) Syme, (*Ouvrage cite*, pp. 51, 52, 58,) *Jæger (Op. cit.*, p. 4, No. 51) and Fricke, (*Ibid.*, No. 53.)

The indications for exsection of the head of the humerus are:—1, Comminuted fractures with wound of the integuments; 2, partial fractures in the thickness of the bone with contusion and wound; 3, complete fractures of the bone with wound, and leaving only the cartilaginous head for the upper fragment; 4, complete fractures of the head of the humerus below its neck, with contusion and wound; 5, fractures of the neck, with luxation of the head of the humerus unreduced, (Exsection proposed by Delpech, *Chir. Clin.*, t. I., p. 242,) and becoming protruded; 6, necrosis; 7, caries and spina ventosa; 8, osteo-sarcoma; and 9, exostoses.

The process to be adopted in this operation must necessarily vary according to the morbid conditions.

### § I. Process of White.

When the greater portion of the surrounding tissues are sound, or the bones are crushed into fragments, we may, after the example of White, M. Larrey and M. Portet, confine ourselves to one incision parallel with the fibres of the deltoid, reaching from the apex of the acromion to four or five inches below, and which penetrates down to the articulation, as

in the process of Poyet for the removal of the arm. Then grasping the elbow with the whole of the hand, White made use of this [purchase] to give pendular motions to the humerus from below upwards, and in order to luxate the head through the soft parts.

## § II.

M. *Larrey* causes the lips of this first incision to be held apart, opens into the fibrous capsule, and then divides by means of a blunt-pointed bistoury conducted upon the finger, the tendons of the supra-spinatus, infra-spinatus, sub-scapularis and teres minor muscles, in such manner as to remove every difficulty in bringing the head of the humerus to the exterior. When the operation is arrived to this point, a thick compress, or some protecting substance is glided between the neck of the bone and the integuments on the upper part of the arm, in order to saw the diseased portion, and thus exsect it.

## § III.—*Process of Moreau.*

Moreau remarked with reason that the simple incision recommended by White, even when combined with the modification of M. *Larrey*, would, in a majority of cases, be found insufficient. According to him, two incisions of four inches long, made, one on the anterior, the other on the posterior border of the arm, and united below the apex of the acromion by a transverse incision, would be infinitely preferable for forming a trapezoidal flap to be dissected and reversed upon its apex from above downwards or towards the insertion of the deltoid. By this means we lay bare all the anterior portion of the articulation. Nothing then is easier than the division of the capsule, and to bring to the exterior the head as well as the upper portion of the humerus, in order to make their exsection. The flap, then raised up on the wound, should be fastened above, and on the sides by a few points of suture.

## § IV.—*Process of Manne.*

Moreau's plan for exsection of the humerus is evidently easier than that of White; but the large flap which differs only from the deltoidal flap of La Faye, in being dissected and reversed at its base instead of detaching it at its apex, renders immediate reunion difficult, exposes to the formation of purulent openings, which ought to be avoided, and should be adopted with scrupulous fidelity. It is better, in case the surgeon wishes to have a trapezoidal flap, to follow the advice of Manne, that is, to make two lateral incisions, like Moreau, then unite them at their lower extremities, and dissect and raise up this flap from its point to its base, precisely in fact as La Faye advises for amputation of the arm at the shoulder-joint.

## § V.—*Process of Sabatier.*

In place of adopting so many precautions to preserve the soft parts, Sabatier formally advises to circumscribe the flap by a large V incision,



with its base above upon the tissues of the deltoid, then to *excise* out [that is, to cut out completely. T.] this triangle, in order to lay bare the articular capsule. It is difficult to comprehend what should have induced Sabatier into such a process, and why he should direct the removal of the flap in question rather than to preserve it. In restricting ourselves merely to raising it up as M. Gauraud did in 1801, and as M. Smith in America has also done, we may extract and exsect the bone with ease.

#### § VI.—*Process of Bent.*

After having in vain endeavored to make trial of the process of White, Bent, who was one of the first to perform the operation of exsection of the humerus, believed it preferable to detach the fibres of the deltoid first outwardly, near the acromion, and then on the inner side at the clavicle and transversely, in such manner as to form a T incision, which enabled him to dissect two triangular flaps—the one on the outside, the other on the inside—whereby he could freely come down to the joint.

#### § VII.—*Process of Morel.*

M. Morel, who was not satisfied with any of these methods, confined himself to the formation of a semilunar flap, with its convexity downwards upon the front of the shoulder. The operation was long, but his patient recovered.

#### § VIII

M. Syme, who has twice exsected the humerus successfully, cuts his flap on the outer half of the deltoid, and gives it the form of a triangle, the anterior branch of which corresponds to the incision of White, while the other, which is much shorter, passes obliquely from below upwards and backwards towards the spine of the scapula. This surgeon, after having raised up this flap, brings the elbow in front of the thorax; divides the capsule; luxates the head of the humerus; excises it; brings down the flap, and proceeds to the dressing.

#### § IX.—*Process of M. Robert.*

The modification proposed by M. Robert, consists in an incision which sets out from the anterior border of the clavicle, at two fingers' breadth from its outer extremity, and which is then carried, in a direction parallel to the axis of the arm, to the anterior part of the stump of the shoulder. The bistoury being directed to the middle of the acromioclavicular space, divides transversely the ligament of the same name, and thus enables us to arrive directly down upon the articulation. Thus modified, the operation has the advantage of rendering the disarticulation more easy, and also of enabling us to avoid the circumflex nerve.

#### § X.

Finally, exsection of the humerus is performed by *two principal methods*, viz.: methods or processes of necessity, and those of election. A single vertical incision, placed towards the outside, suffices for Vigar-

ous, White, Orred, MM. Larrey, Rossi, Baudens, (*Clin. des Plaies d'Armes-à-Feu*, p. 551, 1<sup>e</sup> opéré,) and Thomas. MM. Robert and Malgaigne, who bring down this incision from the apex of the coracoclavicular triangle, prefer placing it in front. It is this incision in front which M. Baudens (*Ibid.*, p. 555, 2<sup>e</sup> opéré) transforms into a T, by dividing the incision into the deltoid muscle, to the extent of ten lines on each side, without implicating the skin. With him the vertical incision commences on the outside of the coracoid process, and is continued through the furrow, which divides the pectoralis major muscle from the deltoid.

A single angular flap, horizontal or lateral and above or in front, was preferred by M. Nève, (unpublished case, communicated by M. Champion,) on account of the situation of the wound and the protrusion of the lower fragment of the fracture. M. Champion, (*Ibid.*,) in another case, cut a horizontal angular flap above and behind, on account of the situation of the gun-shot wound. The incisions then represent a 7, or nearly so, and implicate, by their horizontal branch, the fibres of the upper insertion of the deltoid. The two angular flaps, with the simple T incision, constitute the process of Bent, while the two flaps resulting from the T inverted, or a species of anchor, represent the process of Bromfield, (*Chir. Observations & Cases*, Vol. I., p. 300, and plate 3, 1773.) A single vertical flap outside, pyramidal, reversed, or in V, comprises the process of Sabatier, and those of Briot, (*Histoire de la Progrès de la Chirurgie Militaire en France*, p. 164, 1817,) Poret, Fayet, (*Journal Méd. contin.*, t. XXII., p. 485, 1811,)\* Gouraud, Smith, and Syme, (page 50 and planche 5, fig. I.)

A single outer vertical flap, trapezoidal or quadrilateral, with its base downwards, characterizes the process of Moreau, the father, (*Observations Pratiques Relatives à la Resection*, p. 79,) while this flap, in the process of Moreau the son, (*Essai sur l'Emploi de la Résect.*, etc., p. 16,) has its base above. If terminated by a lower border, which is rounded off or buckler-shaped, (en rondache,) it forms the process of Morel, (*Medico-Chirurgical Transactions*, vol. VII., p. 161.)

### § XI.—Appreciation.

The diseases which indicate exsection of the humerus, are the same as those for which disarticulation of the arm was formerly performed; consequently, the different operative processes employed for this last are applicable to exsection. Thus, in place of cutting out a flap by three incisions, as La Faye did, it is much more simple to imitate Morel, and to form it with a single incision, like Dupuytren, or even to adopt the process of M. Onsenort. It is, moreover, manifest that exsection differs from amputation of the arm at the articulation, only in the last stage of the operation.

A. We may, therefore, adopt sometimes one process and sometimes another, according as it shall seem more easy to isolate the head of the humerus by penetrating from above downwards, or from the outer to-

\* Poret and Fayet, says M. Velpeau, whose names are mis-spelt by Briot and their case misunderstood by M. Gourard, in reality exsected the upper extremity and head of the humerus, which had been fractured, and then become reunited by a diffused callus.

wards the inner side, or in any other manner, and according also as the integuments and muscles shall be more or less altered in one direction than in another. M. Guthrie recommends that, in whatever manner the operation is performed, we should remove as much of the articular capsule as possible, because, says he, the more of this fibrous pouch we leave behind, the less chance will there be of obtaining a free, immediate reunion. This practice, though proper to be adopted in cases of amputation, is not suitable to excisions, because, in these last cases, the limb will have so much the better chance of recovering its strength and steadiness, (*fixité*), in proportion to the greater quantity of fibrous tissues preserved.

B. As soon as the extremity of the humerus is removed, we examine into the condition of the acromion, the coracoid process, and the glenoid cavity of the scapula. If these different parts are not changed, we proceed at once to the dressing; in the contrary case, they are to be removed with the cutting pliers, the gouge, chisel, or saw, in the manner described for the removal of the arm; that is to say, if the degeneration of the bones extends to a certain distance, it will become necessary to prolong backwards, under the spine of the scapula and upon the inner side of the coracoid process, the incisions which circumscribe the base of the flap, in order to lay bare the whole extent of the diseased parts. It is known, also, that, in a case of this kind, M. Larrey did not hesitate to remove the three processes just mentioned, together with the acromial extremity of the scapula. M. H. Hunt adopted the same course in a patient in whom M. Brown had already removed the head of the humerus, in 1818. It is also known that this bold step was crowned with complete success.

C. Moreau had this excision of the scapula in view, when he recommended to reverse the deltoid from above downwards. In that case nothing would prevent our forming another flap in an opposite direction, which would render the removal of the processes of the scapula an easy matter. But as it will always be possible if we cut the flap in the manner of La Faye and Dupuytren, to preserve a sufficient degree of thickness at its root to prevent its mortification, the motive which influenced Moreau, is not of importance enough to permit us to adopt his views.

D. The excision being terminated, we replace the extremity of the body of the humerus into the wound, thus again giving to the arm its natural direction. Whatever may be the form of the flap, the lips of the wound are to be accurately brought together, except only at its most depending angle. In order to keep the edges in contact we are to apply to the root of the limb, pieces of agaric, gateaux of lint, or graduated compresses. A bandage with separate bandelettes, (*vid. Vol. I.*) cushions, splints, or better still the starch bandage, will maintain the whole in such manner as to enable us to dress the wound as often as we judge it convenient to do so, [See notes above on the use of the *starch bandage*, where the articulations are implicated. T.]

E. Some persons have imagined that the portion of the bone removed, might be reproduced. In the case of Chaussier, (*Mém. de la Soc. Méd. d'Emul.*, t. III., p. 400,) it is seen that an osseous conical-shaped mass filled up the glenoid cavity, and ultimately it is true, placed itself in relation with the upper extremity of the body of the humerus, which had



become slightly excavated, and thus actually produced a new articulation, and enabled the arm to execute almost all its movements. In one of the cases related by Moreau, the upper part of the humerus was drawn to, and fixed against the chest, where a sort of accidental articulation was ultimately established. But nothing in these two facts bears any resemblance to a reproduction of the bones, and most usually the upper extremity of the humerus remains movable in the midst of the muscular tissues. In the patient of M. Yvan, (*Arch. Gén. de Méd.*, 2e sér., t. XIX., p. 619,) or that of M. Cloquet, there was no osseous reproduction in front of the shoulder. In the suggestion of M. H. Roux, (*Rév. Méd.*, 1835, t. IV., p. 389,) that we should excise the humerus by a curved section, so as to obtain a sort of head which can accommodate itself to the glenoid cavity, he has not reflected that the arm-bone and scapula after the operation are no longer in contact.

F. The patient, nevertheless, most usually retains the movements of his fingers, hand and fore-arm. He may even be enabled to raise the whole limb to a certain extent in all directions; but it will not be possible for him to raise it either to a right angle to the trunk, or to separate it to any considerable distance from the chest. It remains therefore infirm, after an operation of this kind; but it is much better to have an imperfect limb, which can execute only a part of its functions, than to have none at all, and the last cases reported by M. Syme, conclusively demonstrate, that the uses of the arm in these exsections, may sometimes be almost completely re-established.

## § XII.

This is an operation moreover which exposes to almost as many immediate or consecutive dangers as disarticulation of the arm: the patient of Vigaroux died from the effects of it. Other fatal terminations have been passed over in silence by authors. De la Touche, (*Dissertation sur l'Amput. dans les Fractures des Articul.*, p. 34, Strasb., 1814,) does not know what was the result of the case he speaks of. Grosbois, (*Dissert. sur l'Amput. du Bras dans l'Article*, p. 34, 1803,) is in the same predicament. The two cases of Vernet, (*Lettre Autographe de Vernet*, 1816, Bayeux,) former surgeon in chief of the armies, terminated fatally. The three operated upon by Delpech died between the sixth and ninth days, in consequence of spasmodic accidents. Two also operated upon by Legrand, (*Dissert. sur la Résection de la Tête de l'Humerus*, p. 9, 1814,) died from tetanus. Two also that were operated upon by surgeons of the English army, likewise perished, (Jæger, *Op. cit.*, p. 41, Nos. 40-41.) M. Baudens, (*Gaz. Méd.*, t. VI., p. 425, 1838,) lost one from secondary hemorrhage, and two from cholera, at the moment when the cure was going on well.

In a patient of Moreau, the father, (*Essai sur l'Emploi de la Résection*, par Moreau, fils, p. 18,) the caries after the operation extended to the body of the bone. In a case of Briot, (*Histoire de l'Etat de la Chir. Mil. en France*, p. 164, 1817,) the caries was followed by a fistula, the result of which is not known. M. Jæger, (*Op. cit.*, p. 4, No. 52,) cites a case where amputation became necessary in consequence of necrosis of the medullary canal. In a case mentioned by Knox, (*Edin-*

burgh Medical and Surgical Journal, t. XVIII., p. 62,) the condition of the parts after exsection had been performed, made it also necessary to have recourse to amputation.

A surgeon who divided the brachial artery, during the operation, immediately resorted to amputation of the limb. (This operation says M. Velpeau, was made in presence of a physician who communicated the fact to M. Champion.) A case in which M. Roux, (*Mélang. de Chir. et de Physiol.*, p. 240, 1809,) had exsected the head of the humerus, and rasped and cauterized the glenoid cavity, without reuniting the wound, also ended fatally. In the case mentioned by M. Gouraud, (*Démonstr. des Principes, Oper. Chir.*, p. 178,) the operation was undertaken, when the patient was in a condition which should have deterred the surgeon from performing it. One of the cases cured by M. Syme, (*Ouvrage cité*, p. 58,) afterwards died of phthisis. In the greater number of cases however, the cure has been complete, as in the case operated upon by M. Textor in 1836. It seems just also to distinguish the cases of death consequent upon the operation, from those that had no connection whatever with it.

#### ARTICLE VI.—THE CLAVICLE.

The clavicle, it is true, is situated very superficially, but as it rests posteriorly and below against organs, the wounding of which would be extremely dangerous, surgeons have scarcely dared to undertake its exsection. Nevertheless, circumstances may occur, and these frequently, which seem to demand this operation, unless we wish to abandon the patient to certain death. Sometimes the disease is confined only to the outer extremity of the clavicle, in other cases situated upon its sternal extremity, or in its middle portion, or it may even occupy the whole extent of the bone.

The removal of a sequestrum of the diaphysis or body of the clavicle, and which was followed by regeneration or reproduction of the bone, was performed by Moreau and Dangerville, (*Mém. de l'Acad. de Chir.*, t. V., p. 361, in 4to; t. XIV., p. 160, in 12mo,) also by Bayès, (Brun, *Mém. de l'Acad. de Toulouse*, t. I., pl. 1, fig. 1, et 2. *Lettre d'un Elève en Chirurg. de l'Hôtel-Dieu de Toulouse*, 16 Août, 1792, p. 16,) Otto de Weissenfels, (*Gaz. Méd. Nat. pour l'Allemagne*, No. 46, 1798,) and by Pelletan, the father, (*Champion, Convers. à l'Hôtel-Dieu*, 1802,) who stated in 1802, that he had extracted the clavicle entire in a child in whom this bone was necrosed in consequence of an abscess supervening during small-pox, and which was then afterwards reproduced.

[A large central portion of the clavicle which had been necrosed from syphilis and fractured into two portions, the sternal fragment riding over the acromial, was successively exsected and extracted by its two fragments, (the sternal first,) by M. A. Asson, (see *Giornale des Progressi*, August 1843, *Arch. Gén. de Méd.*, Paris, July, 1844, p. 374-5-6.) T.]

Pezoldi, (*Obs. Méd. Chir.*, etc., C. Pezoldi, p. 126,) who wrote in 1715, thus speaks of a case of exsection of the clavicle: Necrosis, the consequence of abscess; incision; dilatation with a sponge; the clavicle fractured or separated on one side; exsection by means of a cutting

forceps, of the greatest portion of the bone; extraction of one or two splinters, six days after. The child aged nine years, recovered perfectly, and could use its arm as before. A reparation took place of the loss of substance, (F. Cosme D'Armbruste, in Pezoldi, *Obs. Méd.-Chir.*, etc., obs. 62, p. 129, 1715.)

In the case of Kulm, (*De Exostosi Steatomode Claviculæ*, Dantzick, 1732,) the osteo-steatoma or tumor, a foot in length, four inches in breadth, and two feet in circumference, and extending from the clavicle to the mamma on the same side, weighed five pounds. Morgagni (*De Sed. et Caus. Morb.*, epist. L., § 58) speaks of an exostosis of the clavicle, which he declared could not be cured without the intervention of the saw, an operation which the feebleness of the little patient was not able to sustain.

The mode by which this bone should be excised or extirpated, is a difficult matter to describe, seeing that the disease which might make it necessary always causes extensive alterations in the anatomical arrangement of the surrounding parts.

### § I.—*The Acromial Extremity.*

In 1828, in the case of a woman who had been for a long time affected with necrosis in the outer third of the clavicle, I first made a crucial incision, the two incisions composing which, were each about four inches in length. After dissecting and reversing the flaps, keeping them apart, and dividing the acromio-clavicular ligaments, and some bundles of fibres of the origins of the deltoid and trapezius muscles, I was enabled, by means of a piece of wood inserted into the articulation as a lever, to raise up the diseased bone, and to detach it in this manner from the sound parts. If it had offered too much resistance, a hand-saw, or better still, a crested saw, would have sufficed to effect its exsection from above downwards, or from before backwards. Supposing it should be buried too deep [to do this,] it would be necessary to isolate it carefully from the soft parts, in front and behind, and then, to introduce under its lower surface a chain-saw, dividing the bone from behind forwards, and afterwards disarticulating and removing it.

If the skin should not be ulcerated, nor even actually diseased, we might succeed equally well or even better, I think, by cutting a triangular flap, by means of an incision parallel to the anterior border of the clavicle, which incision should be prolonged as far as the apex of the acromion; then another much shorter, which should fall at a right angle upon the outer extremity of the first. The flap being reversed backwards would lay bare the diseased bone completely, enable us to apply the saw upon the sound portion, and afterwards to detach the fragment by means of a strong pair of forceps or the elevator. It would also enable us to excise the corresponding border of the acromion, should the disease have extended to that part. The rowel saw, and M. Heine's osteotome, or M. Liston's sector, should the patient be young, would at the present day render the division of the clavicle in such cases a very easy matter. M. Roux informs me that he has also, in one instance, performed this operation, and with success.



§ II.—*The Sternal Extremity.*

Since M. Wurtzer (Jæger, *Op. cit.*, etc., p. 3) set the example, the exsection of the inner extremity of the clavicle has been performed in a number of instances. The most curious case we have of this kind, and which is anterior to that of Wurtzer, belongs to Davic, (S. Cooper, *Dict. de Chir.*, t. II., p. 104.) A deviation of the spine had depressed the head of the clavicle towards the œsophagus in such manner that the young girl could not swallow. Davic made an incision of two to three inches in length along the depressed bone, and then in order to exsect it, made use of the turning saw of Scultetus. An incision in L, the short branch of which should ascend vertically from the sternum to the trachea, would answer better. A triangular flap would result from this, which, being raised upon the neck, would lay bare the articulation with the inner third or half of the clavicle, which should then be divided, and detached from without inwards. This process would be of more easy application than the preceding to the sternal half of the clavicle; but whether it be at one extremity or the other, the operation is rendered so much the more delicate and dangerous, in proportion as the saw is to approximate nearer to the middle portion of the bone, because of its neighborhood then to the axillary vessels.

§ III.—*Extirpation.*

In the dead body the clavicle is extirpated without difficulty. An incision parallel to its cutaneous border, and which extends a little beyond its extremities, will ordinarily answer for this purpose. Or we may make two other vertical incisions of one to two incisions in length, one on the outside, the other on the inside of the first incision, the flap resulting from which divisions, on being raised up, completely lays bare the bone. We then disarticulate either the sternal or acromial extremity, and grasp it with the left hand in order to raise it up, while with the right, we detach with the bistoury the adhesions upon its lower border. We might also saw the bone through its middle, and remove the two halves separately. When the bone is in a state of disease, this operation must be one of the most difficult in surgery. Notwithstanding which, it was performed with entire success by M. Mott, on the 17th of June, 1827, for osteo-sarcoma in a young man aged nineteen years.

The tumor was double the size of the fist, and extended in one direction to near the angle of the lower jaw and os hyoides, and in the other to the stump of the shoulder and the sterno-clavicular articulation. The author in his letter to me, September 2d, 1838, says: "It is the most important and most difficult of all the operations I have ever performed." More than forty ligatures had to be applied before it was finished.

M. Mott commenced by a semilunar incision with its convexity downwards, and extending from one extremity of the clavicle to the other, as if to detach the tumor from below upwards; he then made a second incision above, reaching from the acromion to the external jugular vein,

divided the platysma myoides and a portion of the trapezius, introduced a grooved director, and then, by means of an eyed probe, passed the chain-saw under the clavicle, and divided it a little nearer the acromion than the coracoid process.

Being still unable to turn back the morbid mass, the operator united, by a third incision, the sternal extremity of the first with the second, tied the external jugular at two points, and divided the vessel on the internal, divided also, the outer portion of the sterno-mastoid muscle at two inches above its origin, and turned it down upon the sternum; was then enabled to push aside the omo-hyoideus muscle upwards and backwards, and was obliged to tie and divide also the internal jugular, and to separate, with great difficulty, by means of cuts of the bistoury or the handle of a scalpel, the subclavian vein, and even the thoracic duct from the degenerated tissues; numerous branches, coming, doubtless, from the inferior thyroid, transverse cervical, supra-scapularis, acromial, and other arteries, were also tied in succession as they were divided.

A last incision, the utility of which I cannot well understand, and which sat out from the first, was made in the track of the fourth rib, in order to divide the fibres of the pectoralis major muscles. After having divided the costo-clavicular ligament and the sub-clavius muscle, M. Mott was finally enabled to remove the whole tumor, and to finish the operation by disarticulating the sternal extremity of the clavicle.

The wound was filled with lint, after which, long strips of adhesive plaster maintained its edges as closely approximated as possible. No serious accident supervened. The cure was nearly completed by the end of July, and by means of an appropriate apparatus, which in some measure replaces the clavicle, the patient retains almost all the uses of his arm.

As an operation of this description ought not to be undertaken except by surgeons of consummate ability, it is unnecessary, as I think, to enter into any detail in order to show in what particulars the process of M. Mott might be advantageously modified. Any person may comprehend this matter without difficulty, by recalling to mind the anatomical relations of the region affected, and will thus be enabled to conform himself to the special exigencies of the case. Thus, Beauchêne, who was obliged to remove a great portion of this bone and the remainder of the shoulder, deemed it advisable to adopt other incisions than those of M. Mott. Kulm, (*Thèse, Chir. de Haller*, trad., t. III.) who appears to have also made the extraction [l'extraction—see note a little farther back. T.] of the clavicle, at the beginning of the last century, equally found himself under the necessity of adopting a process for himself. I do not see, moreover, why the ligature *en masse*, so much extolled by M. Mayor, might not then be advantageously had recourse to by the surgeon, as soon as he has found that the hemorrhage cannot be prevented without a great deal of difficulty.

The patient in whom M. Warren, (*On Tumors, &c.*, p. 148,) had removed the clavicle by means of a crucial incision, died a month after. M. Travers, (*Journ. des Connaiss. Méd.*, 1838, p. 181,) on the contrary, who, in a young girl, aged ten years, extirpated the clavicle entire with the exception of its sternal head, states that he effected the

cure of his patient. M. Roux, who also performed the same operation, leaving behind only the inner extremity of the bone, informs me that he was equally fortunate. In conclusion, it would seem, upon the whole, that the quadrangular flap which I have spoken of, would render the operation easier than by the different incisions of M. Mott.

[The clavicle has been removed, either entirely, or in part, by the following named surgeons, who are not mentioned in the text: viz: McCreary, Mussey, McLellan, Mütter, Syme, Bartlett, Cuming, Roux, Meyer, Chaumet, Regnoli, Liston, Fergusson, Rigaud, Gilbert, Wedderburn, and Sedillot. G. C. B.]

#### ARTICLE I.—FOOT.

Having treated of exsection of the body of the bones of the foot in another article, I will not re-enter into the details of this subject; for so much the greater reason, that it is subjected to the same rules as those of the bones of the hand. I will add only a few words on their extraction, and on the excision of their head.

Already, in the *Encyclopédie Chirurgicale*, (*Encyclop. Meth.*, part. *Chir.*, t. I., p. 107,) on the subject of caries of the bones of the foot, we read this remarkable passage: "It ought to be laid down, as a general rule, that we should never amputate any parts except those that are in a state of disease, even if there should remain but two sound bones in the whole foot; for, by means of a shoe, properly arranged and with a strong sole, a very small part of the foot may become exceedingly useful, especially where it is the bones of the inner side which remain; that is to say, those which correspond to the great toe, and those which are the nearest to these.

"If the disease is situated in the middle of the foot, and the bones of the metatarsus on each side are in a sound state, (*bon état.*) these are not to be touched; we must confine ourselves to removing the bones affected, separating them at their articulations, whether they be diseased throughout their substance, or only in one portion of it; for though it might not be impossible to contrive instruments by which we might cut through a single bone in the middle of the foot, this operation would be much longer and much more painful than the incision of a bone made in its articulations, (*jointures*;) there would not, moreover, be any great advantage to hope for in preserving only one of its extremities. But when there are one, or two, or three bones affected on either side of the foot, as it is inadvisable to save as much of this organ as possible, we must endeavor to saw the bones in a sound portion, and as near as possible to the part diseased." Here have we clearly the whole doctrine of the moderns.

#### § I.—The First Metatarsal.

A lady, in the year 1761, attacked with caries in the first bone of the metatarsus, lost by piecemeal the whole of this bone, except the posterior epiphysis, which remained. There was no reproduction; the action of the muscles brought the phalanx towards the epiphysis, but the patient limped as much after as before the cure. This circumstance in-



duced Lalouette (*Tr. du Scrophule*, t. II., p. 20 et 36) to place a blade of steel in the sole (entre les semelles) of this lady's shoe; this was done so successfully that she was enabled to walk as firmly upon this foot as upon the other. M. Larrey (*Clin. Chir.*, t. III., p. 476) had an idea similar to this, since he proposed to remedy the void left in the foot of a hussar, by means of an elastic sole. Complete luxation of the first metatarsal bone, separated from the first cuneiform bone and placed perpendicularly, rendered its extirpation in another case more easy than in that of M. Barbier. M. Bell (*Cours de Chir.*, t. V., p. 314) performed this extirpation for case of *exostosis* or *osteo-steatoma*. M. Arbey *Coup-d'Œil sur l'Amput. des Membres*, etc., p. 11-12, Strasb., 1805) states that, having removed the first metacarpal bone in a state of caries, there resulted from it a proportional shortening of the finger, at the root of which nothing was perceived but a slight cicatrix.

The disarticulation of the first bone of the metatarsus was also performed by M. Barbier, in the year 1795. Not being able to reduce its luxation, this surgeon decided upon removing it, while preserving at the same time, the great toe. Beaufils, (*Mém. de la Soc. Méd. d'Emul.*, t. X., p. 218,) who published the case in 1797, says the patient was completely cured at the expiration of forty days. M. Pétrequin also (*Gaz. Méd. de Paris*, 1837, p. 36,) says that Mouro had already performed the same operation successfully for caries. M. Blandin (*Biblioth. Méd.*, 1827, t. I., p. 458) has been no less fortunate since. A young man, upon whom I operated in this manner in 1833, at the hospital of La Pitié, also recovered perfectly. The case of M. Lisfranc (Pétrequin, *Gaz. Méd.*, 1837, p. 36) had an exostosis only, and the angioleucite and abscesses which supervened, did not prevent his recovery.

It appears to me, however, that we deceive ourselves upon this subject; after the extraction of the first metatarsal bone, the deformity in reality is greater than after its simple amputation; the toe is liable to be turned inwards, and to change its position and interfere with the uses of the foot. Drawn backwards by the cicatrix, and supported only on merely soft parts, it floats about like an inert appendage, incapable of any use in standing. On the other hand, it is incorrect to say that ordinary amputation is habitually followed by reversion of the foot. It is an accident which doubtless may be met with, but very often does not happen. Authors abound in facts in support of this proposition. The first evidence I had of it was in 1829, at the hospital of Saint-Antoine. I amputated in the usual way; the patient was cured promptly; I have seen him many times since his recovery; he walks continually, and does not even take the pains to support his shoe on its inner side. I have since seen two other instances at La Pitié and five at La Charité. The same result took place in the patient of M. Philips, (*Bull. de la Soc. de Gand*, t. II., 229.) Therefore, it would be prudent to wait for more facts, before asserting that the extraction of the first metatarsal bone ought to be preferred to its amputation. This operation, moreover, appears to have been clearly pointed out by Hey, of Leeds: "When the caries is limited to the metatarsal bone of the great toe, it is usual, says this practitioner, after making a longitudinal and then a transverse incision, to remove its diseased portion with the saw. But as it is sometimes difficult to recognize exactly the extent of the caries, I think it

more advantageous to separate the totality of the bone at its articulation with the first cuneiform bone." If the evulsion of the bones of the metacarpus has met with general approval, it is because, in preserving the fingers, it alters but in a very slight degree the form and important uses of the hand; while in the foot we cannot count on the same advantages, nor on the same results. We should operate, moreover, by the same processes, unless some complication should force us to adopt the course of M. Barbier. At present, also, the process has many modifications. We either excise or disarticulate this bone.

The *disarticulation* of the first bone of the metatarsus is sufficiently difficult. By the *ordinary process*, we make an incision into the soft parts extending from the scaphoid bone to the dorsum of the first phalanx of the great toe, which we in the first place disarticulate. Then causing the lips of the wound to be separated and the extensor tendon to be pushed aside, the surgeon detaches, draws towards him, luxates and raises the head of the bone, isolates it upon its sides by means of the bistoury, and finally separates it from the first cuneiform bone behind. For myself, I have found it more convenient, after the first incision is made, to divide the bone in the middle by the chain-saw, and afterwards to extract its two halves separately. In whatever way it is done, there will be left a considerable void which the cicatrix never completely fills up. No reproduction need be hoped for; hence the extreme mobility of the toe which has been preserved.

*Excision* has not this inconvenience. If it is made only in the body of the bone, as in the patient of M. McFarlan, (*Arch. Gén. de Méd.*, 3e série,) there is a chance that the void (*échanerure*) may be filled up. In the supposition that it may be necessary to remove also its anterior extremity, the operation besides being much easier, would enable the toe to obtain ultimately a point d'appui behind. The extirpation of the entire metatarso-phalangeal articulation which has been performed several times successfully by M. Fricke, (*Ibid.*, 1837, t. II., p. 187—208,) would still be preferable to the total removal of the first bone of the metatarsus.

A quadrilateral flap with its base posteriorly, was first proposed by M. Blandin for these cases. It would seem also that a  $\curvearrowright$  incision placed horizontally and looking forwards (*couché en avant*) had been preferred by M. Roux, (*Journ. Hebd.*, t. II., p. 357.) Flaps cut in the form of folding doors of windows  $\curvearrowright$  (*en battants de fenêtre*), which were disapproved of on account of the *queue* (see Vol. I.—incisions) by M. Syme, and employed in 1813 and 1814 by M. Champion (*Thèse de 1815*, No. 11, p. 94, Obs. 24) in two cases of extirpation of the fifth metatarsal bone, can neither wound nor destroy any of the muscles here. A single quadrilateral flap with its base above or even below, would be better nourished than the flap with its base posteriorly, of MM. Blandin (Paris, *Thèse de Paris*, 1829, No. 162, p. 17) and Jobert. In consequence of the alteration and adhesions of the soft parts which covered the body of the metacarpal bone, M. Barbottin made an ovalar incision from which he extirpated the flap. But the *window-door* flaps, (see a few lines above,) properly extended, and which offer precisely the most liberty at the very spot where we have to lay bare the articulations, have the advantage

also of ensuring the nutrition of the skin better than the quadrilateral flap. Both kinds, however, may be useful.

Though some practitioners commence with the disarticulation, M. Roux on the contrary has preferred sawing at first the first metacarpal bone in its body by means of Aitken's saw. It is evident that we manipulate better around this bone when it is movable, [See notes above in reference to this principle of M. Chassaignac's exsections—also the abrége of his memoir below. T.] “I also, says M. Champion, should prefer this mode of procedure for any one who is in the habit of using the chain-saw,” but in the contrary case, and when we reflect with what readiness this instrument catches, I think we should do better to use the small couteau saw, or one of the known osteotomes, and which could be worked without any preliminary practice. M. Kramer (Jæger, *Œuvr. cit.*, p. 11, No. 1) exsected the anterior extremity of the first metatarsal bone in 1826, for a compound dislocation. M. Josse (*Mémoires de Chir.*, p. 352, 1835) speaks of a case in which the luxated head of the first metatarsal bone was exsected, and the movements of the great toe after the cure were preserved. This excision also must have been successfully performed in the following case related by M. Cruveilhier, (*Arch. Gén. de Méd.*, t. IV., p. 163.) An internal sequestrum was found in a dead body in the anterior extremity of the first metatarsal bone, which bone was of double its natural size. Almost the whole of the bone was necrosed and mobile, in a shell of thin walls, shut up by the most superficial layer of the compact tissue. The cartilage was sound.

M. Blandin, (*Nouv. Bibl. Méd.*, Janvier 1828,) who in one case exsected the anterior half of this bone for a spina ventosa, in another case removed the three anterior fourths of it, (*Journ. Hebdomadaire de Méd.*, 18 Octobre, 1828, p. 75,) being an inch and a half in length, while M. Jobert, (see *Lancette*, t. V., No. 119, 28 Février, 1832, for both these cases,) has removed the anterior half for caries. M. Roux informs me that he has performed this operation three times with success. In a case of caries of the first metatarsal bone, Heister (*Institut. Chir.*, liv. V., ch. 9) exsected only the middle and posterior portion which were the only portions found affected. M. Graefe (Jæger, *Œuvr. cit.*, p. 20, No. 1) also in the year 1828, removed a portion of the first metatarsal. M. Fricke, (Guernet, *Arch. Gén. de Méd.*, 1837) who states that he succeeded in exsecting the whole metatarso-phalangeal articulation of the great toe, appears to have been no less fortunate in removing the phalangeal articulation of the same member in another case! M. Champion (*Thèse*, p. 93, 1815) has twice exsected the posterior extremity of the first phalanx of the great toe, in a state of caries, and in both instances the patients recovered perfectly.

## § II.—Bones of the Tarsus.

Horstius speaks of a case in which a portion of the bones of the foot, of three fingers' breadth in dimensions, was extracted, and in which the patient nevertheless was enabled to walk without limping. De la Motte (*Traité de Chir.*, obs. 264) also extracted with success what remained of the third cuneiform bone, after it had been crushed by a ball. A Captain Franckenburg received a gun-shot wound in the foot; Bil-



guer (*De l'Inutilité de l'Amput. des Membres*, p. 124, § 136) took out nearly all the bones of his foot, and then brought into coaptation the two portions that remained. The operation was so successful that this officer was enabled to walk and to resume his duties by means of a heel of double the usual thickness! Saviard, (*Observ. Chirurg.*, etc.,) who removed a cuneiform bone and some fragments in a case of necrosis, was imitated by De la Motte, who with like success extracted the second and third cuneiform bones, and the fifth metatarsal, which were also necrosed.

M. A. Séverin, (*Méd Efficace*, § 2129, p. 579,) who in the year 1646, extracted carious portions of the astragalus, os calcis, and scaphoid bone, with a knife heated to read heat, says he left in this manner a hollow sinus around the malleolus, which resembled the mouth of a wolf, but that nevertheless his patient got well. A serofulous caries, which a student of law had been affected with for a long time, resisted every kind of remedy, both internal and external, and even the repeated application of fire. A. Didier (*Disc. Prélim. sur la Chir. Prat.* p. 23,) removed the whole of the caries by means of the gouge acted upon by repeated slight strokes of the hammer, and the wound cicatrized in a month.

Pezoldi (*Observations Médico-Chirurgicales*, observat. 70, p. 175, Vratsislavia, 1715, in 12mo) speaks of an operation performed by F. C. D'Armbruste, a celebrated surgeon of Breslaw. A little girl, aged twelve, had had for five years an ulcer situated upon the left foot. *Twenty-seven* bones of greater or less size were extirpated from the middle and outer portion of the tarsus. There remained only those which were connected with the great toe, and the operation was performed with the customary skill of this surgeon. A poor child, aged nine years, who had been affected a long time with swellings of the joints, and whose sufferings were such as to make her wish for death to put an end to them, was operated upon, and cured in the same manner, by the same practitioner. In another case, in spite of the existence of an ulcer, with caries of the great toe of the right foot, and much other disease in the left foot, Armbruste, (*Ibid.*, obs. 89, p. 187,) who is known also under the name of Frère Cosme, did not despair of success. Dilating the narrow fistulas (ulcères) of the left foot by means of gentian, sponge, or incisions, he attacked the carious bones with the rasp or red hot iron, or removed the whole of them completely. The operation being terminated, he filled the cavity with plumasseaux, saturated with a particular remedy. The patient was put upon the use of antiscorbutics, and got well in a few weeks.

De Housse, (*L'Esprit des Journaux*, Février, 1775, t. II., p. 351, in 12mo,) a surgeon of Liège, relates a no less curious fact. M. \* \* \*, aged thirty-six years, sprained his foot when fourteen years of age; having been improperly treated, the injured part suppurated repeatedly. Dilating the ulcerous openings into one wound, by cutting through the bridges which united them, and then laying bare a portion of the bones, De Housse was enabled to take away in succession the three cuneiform bones. In order to remove the cuboid bone, he enlarged the wound near the tendo Achillis, and divided the peroneus longus muscle. Two days after he removed the scaphoid bone. All these bones could be

identified, and were black and cragged in their appearance, as if rotten. The void left by their extraction, and by that of some portions of the neighboring bones was so considerable, that De Housse made a counter opening on the inner side of the foot, to do which nothing more was necessary than to puncture through the skin. In a very short time this void was filled with sound flesh, and the cure was complete at the end of two months. The cicatrix was firm and deep. The patient was enabled to walk without anything to assist him, and without being fatigued, the distance of ten leagues! Moreau, the father, (*Essai sur l'Emploi de la Résection des Os*, p. 109,) in 1788, extirpated the cuboid, the third cuneiform, the posterior extremity of the fourth metatarsal, the inner side of the same extremity of the fifth, and the articular surface by which the os calcis is united to the cuboid.

Dunn, (S. Cooper, *Dict. de Chir.*, t. I., p. 96, col. 2,) in a case in which he extirpated several bones from the tarsus, and also the upper portion of the astragalus, had a hemorrhage come on so abundant that he found it difficult to arrest it. There is a case of Durand, (*La Théorie du Chir.*, t. II.,) of a patient, aged sixteen years, who in the year 1745, while sliding, injured the foot in such manner as to lead to the supposition that the fibula was dislocated. Abscesses formed, and on opening, left fistulas; the foot was so swollen and round as to resemble a ball; while the leg and thigh became atrophied. Durand, after ascertaining the existence of caries of the os calcis, astragalus and cuboid bone, made two incisions, dilated the fistulous openings into one wound, laid bare the diseased bones and instantly removed to the number of about ten fragments, which were entirely separated. The swelling subsided; *twenty-one* cauterizations with the red hot iron were now had recourse to, and the whole number of pieces of bone that were taken away, amounted finally to 37. The patient enlisted, and served 13 years, dating from the year 1751, his foot and leg not differing apparently from the other limb. M. Liston, in 1821, (Jæger, *Op. cit.*, p. 26, No. 3,) removed the astragalus, scaphoid and two cuneiform bones, together with the internal malleolus at the same time, and M. Arbey (*Coup-d'Œil sur l'Amp. des Membres*, p. 11, 1805; *Thèse de Strasbourg*) says that in 1805, he was an eye-witness to the extirpation of the cuboid, and third cuneiform bone. The extirpation of the cuboid, and of a part of the neighboring bones was made by M. Syme, (*Treatise on the Excision of Diseased Joints*, ch. IX., p. 143.) M. Malvani, (*Gaz. Méd.*, p. 314, No. 24, 1838,) after extirpating the two last cuneiform bones, had recourse to repeated use of the hot iron to the scaphoid, and cured his patient, a child, aged twelve years. M. Champion, (communicated by the author,) after having extirpated the cuboid, scaphoid, and three cuneiform bones, and the tarsal extremity of the third, and also of the fourth and fifth bones of the metatarsus, found the caries re-appearing in the other bones before cicatrization took place. A similar case, which has not been published, occurred in the practice of Moreau, the son. The case in which M. Liston, in 1832, removed the os naviculare, two cuneiform bones, and the upper surface of the astragalus, did not succeed. Jæger (Jæger, p. 26) also has extirpated the astragalus and scaphoid bone.

The cuboid scaphoid and great cuneiform bones, should they be alter-

ed to such extent that they could not be preserved, might be separately removed, as for example in a case of dislocation, complicated with caries and rottenness, or with necrosis. M. Moreau in this manner was enabled to save the greater part of the foot to one of his patients, by confining himself to the removal of the cuboid bone, the third cuneiform, a part of the os calcis, and the posterior half of the fifth metatarsal bone. It was thus, also, that in the year 1636, Heurnius (Patric, *Lancette Française*, t. IV., p. 88) extracted with perfect success the *cuboid and third cuneiform* bones, and it is in this manner we ought to proceed, in reality, wherever the disease is found to be perfectly circumscribed, and we are certain of removing it totally without being obliged to sacrifice the other portions of the foot. But here also there are no precepts that can be laid down. The enlightened surgeon will always know how to regulate his conduct by the circumstances in which he is placed, and to select the process which is best adapted to each particular case, while he will not forget also that these partial amputations are not unattended with danger, and that they are often followed by consequences more formidable than actual amputation of the foot or leg.

Now that we possess rowel saws, flat or mushroom-shaped, we can excise these bones with less danger than if it were necessary to disarticulate them. By means of a T incision, whose horizontal branch was placed on the outer border of the foot, I was enabled with the mushroom-shaped rowel saw to lay bare and remove almost the whole of the cuboid bone and the posterior extremity of the fifth metatarsal bone, in the case of a young man (Pétrequin, *Gaz. Méd.*, 1837, p. 36) who recovered with scarce any deformity remaining.

*Os Calcis.*—I shall be obliged for other matters appertaining to this subject, to refer to the chapter on *Articular Exsections*. The subject of amputation of the projecting portion of the os calcis, which I have performed six or seven times successfully, will have to be resumed upon that occasion.

## § II.—*Astragalus*.

The extraction of a portion of the astragalus, dislocated and with or without fracture, and either necrosed or retaining its vitality, has been performed by Duverney, (*Traité des Malad. des Os*, p. 458, t. II., Obs. 8;) while this bone in another patient exfoliated almost entire, yet he could walk with this leg as with the other, though it was ankylosed. In the case of Anbray (*Anc. Jour. de Méd.*, t. XXXVI., p. 361, 1771) the astragalus was extracted on the first day of the fracture and luxation; and in that of Rumsey (*Dislocations and Fractures*, etc., by Astley Cooper, p. 230) the loss of the greater portion of its body did not prevent the almost entire restoration of the movements of the foot. Charley (*Pract. Obs. in Surgery*, by Hey of Leeds, p. 386) succeeded in a case in which the extraction of the body of this bone which had been luxated and fractured, was not made till the twelfth day after the accident. In a case of unreduced luxation, Hey (*Ibid*) proposed exsection; the patient refused; gradual exfoliation of the protruded portion of the astragalus, in small fragments, then followed. In a patient of Battley (A. Cooper, *Œuvr. Chir.*, etc., p. 202) a portion of the astra-



galus which had been fractured in its position (*sur place*) was extracted through the accidental wound. Lynn (*Ibid.*) saw a case in which the astragalus exfoliated in two portions with an interval of six weeks. Trye, (Hey, *Œuvr. cit.*, p. 383,) in the case of Madame Palmers in 1789,) in which the astragalus was luxated, complicated with laceration, and irreducible, exsected it with very little difficulty.

The successful cases of extraction or removal of the dislocated astragalus are moreover numerous and of various kinds. Fabricius of Hilden, (*Opera*, p. 140, Obs. 67, cent. 2, t. I.,) published a case of this kind in 1582. This operation has been performed since by Vonder Broille (*Geschichte und Versuche einer chirurgischen Privatgesellschaft*, etc.) in 1773, also by Marrigue (*Diss. sur les Fract.*, par Michault de Versailles, p. 55, 1782,) Ferrand, Mauduyt, (*Méd. Eclairée*, par Fourcroy, t. II., p. 63, 1791,) Laumonier, (*Ibid.*, p. 60,) and Desault, (twice,) and who also saw other cases; by Boyer, Hey, (*Practical Observ. in Surgery*, p. 383,) Collin, (*Journ. de Méd. cont.*, t. XVII., p. 438,) Percy, (*Operatio Resectionis Conspectu*, etc., Jæger, p. 25, No. 12,) Despault (*Journ. de Méd. cont.*, Dec., 1812, p. 388; et *Bull. de la Fac. de Méd.*, Paris, t. III., p. 238,) Daniel, (*Journ. Gén. de Méd.*, t. XLIV., p. 293,) and Evans (*Practical Observations*, &c., 1815; and S. Cooper, (*Dict. de Chir.*, t. II. p. 127–128; by Dupuytren, the third of April, 1818, on a woman, the nature of whose injury was unknown during the first days; by M. Roux the 20th of September, 1817, and again by him a second time (communicated by the author;) also by M. Larrey, (Jæger, *Ouvr. cité*, p. 25, No. 16,) Dufaure, (*Journ. de Méd.*, *continué*, t. XXII., p. 348,) West, (*A Treatise on Dislocation and Fractures of the Joints*, p. 263,) and A. Cooper, (A. Cooper, *Ibid.*, p. 268.)

Many other surgeons also have performed the evulsion of the *astragalus*, and by this means preserved to the patient the uses of his foot and leg. Additional examples are related by Dupuytren, (*Journ. de Méd.*, 1812; *Bull. de la Fac.*, t. III., p. 238; this case, says M. Velpeau, as well as that of Despault, belong to De Cugnières,) by Follet, (*Arch. Gén. de Méd.*, t. XVIII., p. 462; t. XX., p. 293,) Dassit, (*Bulletin de Férussac*, t. VIII., p. 325,) and De Cugnières. In a case operated upon by M. A. H. Stevens, (*Medical and Physical Journal*, Vol. V.,) in 1826, the tibio-tarsal articulation continued movable, and the limb scarcely deformed. But the cases are rare, except after luxations with laceration of the soft parts, that such an operation is either indicated or practicable.

As the state of the parts after the wound, is scarcely ever the same in two different persons, it is impossible to lay down any fixed rules to be followed for the process. We dilate the wound sometimes in one direction, sometimes in another, according as the exigencies of the case require, taking care, however, to divide the tendons no more than is absolutely required, and to operate before the constitutional reaction has had time to set in, and as soon as possible after the accident.

This operation has been performed also by MM. Barbioux brothers, (*Journ. Complém. du Dict. des Sc. Méd.*, t. IX., p. 285, 1821,) Weber, (Jæger, p. 26, No. 23,) Lochmann, (*Bull. de Férussac*, t. II., p. 333,) Champion, (unpublished—communicated by the author,) and Cloquet, (Jæger, *Ouv. cit.*, p. 26, No. 26.) In the cases mentioned by G. Nor-

man (A. Cooper, *Ouv. cit.*, p. 252) and M. Green, *Illustrations of some of the Injuries to which the Lower limb is exposed*, p. 30, 1802,) the extraction of the astragalus, performed in consequence of luxation, appears to have been followed by retraction of the tendo Achillis or a pes equinus.

The extraction or excision of the *astragalus in a state of caries*, but still in its natural position in respect to the leg and foot, has been performed, 1st, by Moreau, the father, (*Essai sur l'Emploi de la Résection*, par Moreau, fils, p. 89,) who removed the superior articular surface, and a great portion of the body, by means of the gouge; 2d, by Moreau, the son, (*Ibid.*, p. 93,) who removed it entire with the gouge, the presence of a sound fibula preventing him from luxating the foot; 3d, by M. Champion, (unpublished case, communicated by the author,) who extirpated the entire tibial portion with the saw; 4th, by the same surgeon after excision of the fibula and tibia, (*Ibid.*)

In a patient of Desault, who died two months after the operation, of hospital fever, the tibia was found in a state of almost complete consolidation with the os calcis. In a case of Hey, (*Pract. Observations in Surgery*, p. 383,) the patient at first did very well; but being asthmatic, he died between the second and third week; the patient of Norwood, (*Jæg.*, *Œuvr. cit.*, p. 28, No. 18,) also died, as did one of those of July, 1830, (*Journ. Univers. Hebd.*, et *Journ. Complém.*, t. XXXVII. p. 33, 1830,) that of M. Dassit, (*Journ. Gén. de Méd.*, t. XCIII., p. 183, 1825,) that of M. J. Cloquet, (*Journ. Hebdomad.*, t. I., p. VII., 1831,) and one of my own.

The success of the operation was doubtful in the case of M. Hesselbach, the son, (*Jæger*, p. 26, No. 27,) and amputation had to be had recourse to in the patient of Duverney, (*Maladies des Os*, t. II., p. 276,) who nevertheless died. The patient of Bromfield, (*Practical Obs. in Surg.*, by Hey of Leeds, p. 382,) also died, and that of Gooch, (Tome II., p. 369,) perished on the twenty-seventh day in consequence of imprudence; while in the cases of Castel, (Bornemann, *Sensibilité des Tendons*, Th. de Haller, t. III., p. 307,) A. Cooper, Boyer, (*Traité des Mal. Chir.*, t. IV.), and Dupuytren, (*Trad. du Dict. de M. S. Cooper*, p. 64,) the cure on the contrary took place without any delay.

## ARTICLE II.—THE TIBIO-TARSAL ARTICULATION.

Gooch (*Wounds and other Surg. Subj.*, 1667,) a long time ago performed with success the operation of exsection of the lower extremity of the tibia. This operation was repeated by Cooper, (*Trad. de Park*, p. 7,) Hey, (*Pract. Obs.*, &c., 1814,) Deschamps, (*Bull. de la Fac. de Méd.*, 7e année, p. 141,) White, (*Cases in Surgery*, 1770,) Park, (Jeffray, *Op. cit.*, p. 71,) Delpech, and Moreau, (*Op. cit.*, 1803, 1816,) the father and son. Josse, (*Bull. de la Fac. de Méd.*, t. VI., p. 414,) and M. Roux, (*Journ. Hebd. Univ.*, t. II., p. 357,) have also successfully exsected the tarsal extremity of one or both bones of the leg. Though they removed two inches of the right tibia, in one case, and more than an inch from the left tibia and fibula in another, the patient of Josse at the end of three months walked with the aid of a cane, which she has since been enabled to dispense with. Repeating this

operation on a woman, in whom he exsected only the tibia on the fifth day of the accident, on a man aged seventy-three years, and on another man aged sixty-five, Josse, (*Mélang. de Chir.*, p. 310, 315, 321, 332,) was alike successful in all of them. M. Veiel, (*Gaz. Méd.*, 1834, p. 747,) was equally fortunate though he did not operate until the eighth day. MM. Walther, Textor, Jæger and Heine, (*Ibid.*, p. 644,) also speak very highly of this exsection, which I have performed twice on the tibia only, which M. Patry, (*Thèse* No. 289, Paris, 1837,) has seen twice performed by M. Thierry, and of which he relates *sixteen* cures out of seventeen cases, taken chiefly from M. A. Cooper.

The numerous cases of dislocations of the foot, complicated with fracture and protrusion of the bones through the skin, in which it has been found necessary to extract the astragalus, exsect the tarsal extremity of the tibia, or fibula, at the same time or separately, either to reduce the displacement, or to prevent or arrest the accidents, which menaced the patients; and the advantages which the patients have thereby obtained, have now consecrated the utility, of this kind of operation. Emboldened by his experience, Josse, (*Mélang. de Chir., Prat.*, p. 310, obs. 26,) has even extended the application of this exsection to luxation of the tibia, with fracture of the fibula and displacement, *but without any wound*, in order to combat symptoms of a very serious character.

It is true, that in almost all these cases, this excision has not been decided upon, except in those of compound dislocations, or comminuted fractures; but many persons have employed it also for organic lesions, that is to say, where the parts had not changed their natural relations. In 1792, Moreau, the father, performed the peroneo-tibial exsection, in a case where the articulation was entire, and where there was no displacement of parts. The leg of the patient was seen and admired by A. Dubois. Moreau, the son operated upon a man of the name of Meunier, in 1796. The most serious objection to this last operation was, the omission to exsect the fibula, which left the patient a cripple. In 1810, Mulder, exsected five inches from the fibula affected with caries. In 1832, Jæger, (*Op. cit.*, p. 9, No. 4,) could not yet say what had been the result of this operation. On the 6th of March, 1813, M. Champion operated in the same manner on Therese Péru, who has repeatedly since, walked three leagues on foot to show herself to MM. Roux, Flamart, Fodéré, &c. M. Liston, (d'après Jæger, p. 9, No. 5,) also as I have said above, removed in the same manner, in 1821, the internal malleolus, the astragalus, the scaphoid and two of the cuneiform bones. The details of these cases would doubtless elucidate the history of the preservation of the fibula, when the tibia has been exsected with the astragalus. On the 3d of April 1830, M. Champion also operated for caries upon Etienne Chauvel, who at present can use his foot very advantageously. In 1832, M. Roux was less fortunate, and lost his patient.

I. *Process of Moreau.*—Moreau recommends that we should make two incisions on each side of the leg, one which should reach from the apex of the malleolus to three or four inches above it; the other which is to commence at the same point, and to be brought transversely in front to the insertion of the peroneus tertius muscle, for the outer side,



or that of the corresponding tibialis anticus, for the inner side. The longitudinal incisions should go down to the bone and the others comprise only the skin. We commence with the dissection of the outer flap in order to disengage the fibula from the tendons which surround it, and then to exsect it with the chisel or the crested saw above the part which is diseased, disarticulating it from above downwards, while dividing the fibrous bundles which unite it to the tibia, astragalus and os calcis. The same manipulation is employed to isolate the fibula from the soft parts, in order to exsect and then disarticulate it. If the astragalus itself should be diseased, it would be requisite to remove it also, in whole or in part, as was done by Moreau, the son. After the operation, the foot should be brought gently into approximation with the lower extremity of the leg, and maintained in this position by strips of adhesive plaster, and a suitable starch bandage.

### § II.—*Process of M. Roux.*

We perceive that Moreau follows in this operation the same process he adopts for the carpal extremity of the fore-arm. In place of the chisel or mallet, it would be more advantageous at the tibio-tarsal articulation than anywhere else, to use the trephine or the link-chain saw. In spite of the narrowness of the inter-ossal space, M. Roux was enabled, on one occasion, to insert a compress through it, which thus enabled him, after introducing Jeffray's saw between the bones and the soft parts, to exsect without danger, first the fibula and afterwards the tibia. The osteotome of Heine, or the rowel saw, moreover, would, at the present time, render the section of the bones by these processes quite an easy matter.

### § III.—*The Author.*

I should prefer, however, if the tibia or fibula alone were concerned, to lay bare the diseased malleolus, by means of a large semilunar flap, whose convex border should face upwards and forwards. By reversing this flap backwards and downwards, we should have every facility for exsecting and removing the diseased bone. Two such flaps would equally enable us to exsect both bones.

### § IV.—*Appreciation.*

This exsection, which is always a difficult operation, will sometimes be followed by severe accidents. A case operated upon by M. Roux terminated fatally. After the most perfect cure, the limb will have necessarily lost a portion of its length, and the patient cannot walk without the aid of a shoe more or less elevated. It presents, then, but few advantages over amputation of the leg. The exsection of the tibia alone, especially, does not seem to answer the purpose the surgeon has in view. The foot thus losing its principal point d'appui, will be incapable of sustaining the weight of the body, and everything leads to the belief that it will be turned inwards, as Moreau remarked in one of his

patients. It would appear, therefore, that the fibula, although it be sound, ought in these cases to be excised at the same time with the tibia.

### § V.

When the *tarsal extremity of the fibula* is to be removed, would its loss necessitate also the exsection of the tibia? "To judge of this question," says M. Champion, "by what happens in cases of fracture of the lower extremity of the fibula, when we cannot reduce it as we wish, we may answer, as I have done in 1815, in the affirmative; but at the present time, and in other cases, I should willingly leave this question open."

Gouey, (*La Veritable Chirurgie*, Rouen, 1716, p. 130,) in 1716, published the case of a man, in whom an empiric extirpated, without any apparent reason, the lower part of the fibula which had been fractured at three fingers' [breadth] above the malleolus, and had protruded through the flesh. Improper treatment resulted in necrosis, and made it necessary to resort to extraction of the astragalus. Nevertheless, and in spite of other accidents still, the patient got well, and *could walk without a cane, and as though he had not lost the astragalus*. Gouey attributes this result to an osseous juice, which, having oozed out and coagulated in the void left, had formed an irregular callus, which could be felt through the integuments at the spot and place which the fibula had occupied.

Faure (*Prix de l'Acad. de Chir.*, in 12mo., t. VIII., p. 50, Obs. 2; et in 8vo, t. III., p. 352, 1819,) quotes from Read, a case of wound from a fire-arm, in which it became necessary to extract the lower third of the fibula, several portions of the lower extremity of the tibia, and some fragments of the astragalus. The fibular portion was not produced; the osseous juice had formed a species of incrustation which had become united to the tibia, and the whole formed but one bone. It would appear that an ankylosis had taken place between the tibia and the astragalus, and that it was this consolidation which must have prevented the deviation of the foot. It is much to be regretted that the cases which M. Cooper (*Œuv.*, &c.; *trad. Franç.*, p. 42-56) obtained from MM. Ransome, Maddocks, Ormond and another person whom he does not name, and in which the external malleolus (without anything being said of deviation) was removed, are too deficient in details to afford any light upon this point of practice. I would express the same regret of the case of exsection performed by Mulder, (*Watchter, Œuvr. cit.*, p. 154,) in which he removed five inches of the lower and articular extremity of the fibula affected with caries, but of the result of which we are left in ignorance.

The organs to be avoided are: 1, in front, the tendons of the tibialis anticus muscle, those of the extensors of the toes, and of the peroneus tertius; 2, outwardly, the peroneus longus and peroneus brevis muscles; 3, on the inner side, the tibialis posticus muscle and the flexors; 4, behind the semi-muscular portion of the same organs; 5, finally, the anterior tibial artery in the first direction, and the posterior tibial with the nerve, behind the internal malleolus.

## § VI.

Exsection of the tibia, in consequence of fracture of its tarsal extremity, was successfully performed by Hey, (*Pract. Obs. in Surg.*, p. 363,) in 1799, and that of the malleolus internus, with removal of the astragalus, has been performed by Weber, (Jæger, p. 10, No. 25, et p. 26, No. 23.) Examples of exsection of the tibia in cases of tibio-tarsal luxations with laceration of the integuments, have been related by Serrin, (Observation addressed to the Academy of Surgery, recompensed with a medal of gold, 1776,) Marrigues, (*Dissert. Physiol. et Chirurg. sur la Formation du Cal.*, &c., p. 26, 1783,) by Taylor, (*Pract. Obs. in Surg.*, by Hey, p. 381, 1805,) who performed this operation four times, by Kerr, (*A Treatise on Dislocations and Fractures of the Joints*, p. 67, Sir A. Cooper, p. 229, 1831,) who performed it several times, (plusieurs fois,) Lynn, (*Ib.*, p. 239,) Flour, (*Ann. de Méd. de Montpellier*, 1809,) who performed it three times; by Averill, (In A. Cooper, p. 228; *trad.*, p. 52,) Cooper of Brentford, (*Ib.*, p. 237,) by A. Cooper, (*Ib.*, p. 235; *trad.*, p. 54,) Vernhes, (*Ann. de Méd. Clin. de Montpellier*, t. IX., p. 186, 1820,) Sandfort, (A. Cooper, p. 226; *trad.*, p. 51,) Graefe, (In Jæger, *Oper. res. Consp.*, etc., p. 9; A. Cooper, *tr. Fr.*, p. 55,) and Tyrrel, (in Jæger, p. 10.)

Examples, on the other hand, of exsection of the tarsal extremity of one or both bones of the leg, are related by Kirkland, (*Ibid.*) Moreau, the father, (*Essai sur l'Emploi de la Résect. des Os*, p. 94,) who excised the lower extremity of the tibia, sawed off the two fragments of the fracture of the fibula, and left the external malleolus; by Hicks, (A. Cooper, *cité*, p. 233; *trad. Fr.*, p. 54,) Fletcher, (*Ibid.*, p. 238; *trad. Fr.*, p. 54,) and A. Cooper, *Ibid.*, p. 225; *trad. Fr.*, p. 51.) The exsection or removal of the astragalus in a state of caries, has been performed once by Moreau, the father, (*Essai sur l'Emploi, &c.*, p. 87,) and twice by M. Champion, (Unpublished Observation, communicated by the author;) M. Roux, in going to Plombières sixteen years since, had an opportunity of seeing the first of these two cases. This exsection has been once performed also by Moreau, the son, who confined himself to the exsection of the tibia alone, and the astragalus. Ransome removed the external malleolus which had been separated by fracture, and Moreau, the son, (*Essai cité*, p. 98,) removed in this manner the anterior half in a state of caries.

## ARTICLE III.—EXSECTION OF THE KNEE-JOINT.

## § I.

Caries, necrosis, abscesses, tubercles, cancers, and all those kinds of lesions comprised under the name of white swellings, often become so serious as to be beyond any other remedy than the removal of the diseased parts. As amputation of the thigh removes the whole of the limb, and obliges us to sacrifice a great extent of sound parts, the question has been asked if it would not be possible to restrict ourselves to



the removal of the tissues and the portions of bone actually diseased : from whence has originated the idea of exsection of the knee-joint. It is an operation which consists in the extirpation of the articular extremities of the femur or of the tibia, or of all those parts at the same time.

The excision of the bones which form the femoro-tibial articulation, has now been performed upon living man a great number of times ; once by Filken, (Jeffray, *Op. cit.*, p. 52) in 1762 ; once by Dr. Park, and with such success as to enable the patient to walk without a cane, (*Nouv. Méth. de traiter les Maladies qui Attaquent le Genou*, trad. Franç., 1784,) the third time by Moreau, (*Obs. sur la Résect. des Art.*, 1803,) and once by Moreau, the son, (*Essai sur la Résect. des Os*, 1816,) whose patient for a long time was obliged to make use of crutches. Mulder (Watcher, *De Articulis Extirpandis*, etc., 1810) related a case of this kind in 1809 ; M. Roux (Private Correspondence, 1831) has published another case ; his patient died on the nineteenth day. M. Crampton (Syme, *Excisions of Joints*, 1831) has performed this operation twice : on a girl aged twenty-three years on the 7th of May, 1823, and on his second patient in 1834. The first survived, and actually is enabled to walk without crutches, notwithstanding the deformity of the limb ; the other died from the consequences of the operation. M. Syme (*Op. cit.*, p. 29) also has performed this operation twice : one of his patients died on the eighth day, the other, a child aged eight years, recovered and walks very well. M. Fricke informs me that he has performed it four times. MM. Jæger and Textor also have each performed it once, (Coulon, *Op. cit.*, p. 45.)

[Writing in 1831, Mr. Syme gives the following satisfactory account of his first case :—"In the course of four weeks after the operation, the wound was all but healed, and the limb, before the expiration of three months, had regained so much strength that the patient could make some use of it in walking. It has been progressively improving since, and is still doing well. I have no doubt that ultimately it will be nearly as useful to him as ever ; but even at present he would be very sorry to exchange it for a wooden one. He can walk and run, though with a halt, without the constrained appearance of a person with an artificial leg, and merely requires the *heel* of the shoe to be two inches higher than the other. The limb is stout and well nourished, and though slightly bowed outwards, does not occasion any disagreeable deformity ; it allows a slight degree of flexion and extension." Seventeen years later, however, a much less satisfactory account of the same patient is given. In speaking of excision of the knee-joint, in 1848, Mr. Syme says :—"I tried the operation nearly twenty years ago on a boy, who recovered perfectly from it, and seemed at first to possess a limb little inferior to its fellow, except in so far as it was stiff at the knee. But in the course of time it was found that the growth of the two limbs was not equal, and that the one which had been the subject of operation gradually diminished in respective length, until it wanted several inches of reaching the ground, when the patient stood erect." G. C. B.]

Exsection of the knee in consequence of compound fractures, also requires to be mentioned. In the patient operated upon by Read (*Prix. de l'Acad. Chir.*, in 12mo, t. VIII., p. 47 ; in 8vo, t. III., p. 352) the external condyle of the femur and a portion of the patella had been

crushed to pieces by a ball. After having dilated the wound in order to extract the detached fragments, crowns of the trephine were applied to a part of the bone in order to remove a portion of it of the width of two fingers' breadth. No serious accidents supervened. An abscess which formed at the lateral and posterior part of the thigh, enabled the surgeon to extract the ball four months after the accident; a large sequestrum of three fingers' breadth, was removed at a later period by means of an incision, and the cure was not completed until at the end of eleven months. The patient was enabled to walk without any assistance but with a thigh shorter than the other by four inches. Heaven forbid that I should give this operation for a pattern, although it is very remarkable! Read was like Gelée, more fortunate than skillful. In another case M. Travers (cité par Jæger, p. 8, No. 13,) confined himself to the exsection of the external condyle of the femur. Three inches of the tibia and of the head of the fibula, a small portion of the patella and of the condyles of the femur, were, says Percy, (*Manuel du Chir. d'Armée*, par Percy, p. 262,) carried away by a small bullet. Serious accidents and danger of the loss of life succeeded to this wound: the commotion, however, subsided, and the exfoliation of the bone was promptly followed by a cicatrix with ankylosis.

A fracture existed at two fingers' breadth from the knee, and the tibia protruded outside to the extent of three fingers' breadth. The reduction was difficult, notwithstanding the usual dilatations; the cure was protracted to eight months in consequence of the exfoliation of the tibia, all the upper part of which was removed; the cicatrix which remained being so deep that the patient in putting on his boot was obliged to fill it up with a pelote of linen of the size of a tennis ball. Saviard (*Observ. de Chir.*, Obs. 28) who relates this case, does not say what effect this accident had on the walking of the patient.

A young man whose case is given by Janson (*Compte-rendu de la Prat. Chir. de l'Hôtel Dieu de Lyon*, p. 77, 1822) fell with his knee upon the cutting edge of a scythe. The articulation was laid open to a great extent. The lower extremity of the femur, which was luxated upon the leg, was split from below upwards to the extent of two inches. The laceration was so extensive, that no other resource was left but amputation of the thigh; the patient objected to this, but consented to exsection. *The operation was very long and very laborious.* After having disarticulated the femur, Janson passed an amputation knife into the popliteal space in order to detach the soft parts and artery from the bone; the bone was then sawed off and the whole united as accurately as possible. Some hope of recovery was entertained until the fifteenth day; but the impossibility of maintaining the extremity of the femur in a fixed position, from the rotating muscles of the thigh constantly turning it outwards, together with the abundance of the suppuration and some aberrations in the regimen, caused death on the thirtieth day.

In a case of caries of the inner condyle of the tibia, M. Champion (*Thèse de 1815*, p. 7) having cut out a square shaped flap, was enabled by means of the gouge and chisel, to remove the whole of the diseased portion of the bone to the depth of near an inch, together with the ball which had become embedded in it. Desport (*Traité des Plaies d'Armes-à-Feu*, p. 225) also thinks that in cases of fracture of the leg

we ought not to be in too great haste to amputate, if no other part is fractured but the upper portion of the fibula, unless the neighboring bones or some other important parts should be implicated. Scultetus (*Arsenal de Chir.*, 2e part., p. 104, obs. 81, 1712) having extracted a sequestrum of considerable size from the tibia, removed by means of the trephine *the head of the fibula which was in a carious state* and cured his patient. Bécларd was equally fortunate in exsecting the extremity with the upper third of the fibula, for a spina ventosa or medullary fungus.

## § II.

It is certainly not because of the difficulties which exsection of the knee joint presents that it ought to be proscribed, but because it is infinitely more painful, tedious and dangerous, either immediately or subsequently, than amputation in the continuity of the thigh; and especially because in the most fortunate cases the limb preserved is in reality not as useful to the patient as an artificial leg. As a necessary consequence there must be a shortening of from three to eight inches; the articulation cannot be restored; the limb if it preserves the faculty of motion performs it only in a very irregular manner, and most usually is strongly deviated outwards. Of the cases that have fallen under my observation, ten at least have perished, some like the case of M. Roux at a very short interval after the operation, others after having suffered for a long time; all those who have been cured have obtained this result only by means of extraordinary care, and not without having incurred the greatest danger of losing their lives; it is also certain, notwithstanding what M. Syme may say, that none of them can do with their misshapen limb what they would be enabled to execute with a wooden one properly made. The case of Moreau, the father, (*Op. cit.*, p. 57,) died three months after the operation, of an epidemic dysentery; the limb had undergone much shortening. A second case operated upon by Park in 1789, died from exhaustion at the expiration of four months, (Syme, *Op. cit.*, p. 129.) The first case of M. Crampton died three years and a half after the operation, without ever having been perfectly cured; the other walks with a sole which has to be four inches thick, (*Dublin Hospital Reports*, Vol. IV.) That of Mulder terminated fatally. M. Fricke, who cured only one out of four cases, hopes never to repeat the operation. The first case operated upon by M. Textor also died. Another patient whom this surgeon operated upon in 1836 (Communicated by M. Sprengler, November, 1838) was equally unfortunate. In the case of M. Jæger (*Rust's Handb. der Chir.*, Band V., p. 626; et *Op. Rés.*, p. 8, No. 12) the result at first was most flattering, since from the figure that M. Adelmann sent me of it, and especially from what this physician who attended to the progress of the case has told me, the patient scarcely limps, and can without any impediment undergo the most fatiguing labors; but as he has not been cured but five months, and as the limb which is shortened three inches is strongly deviated outwards, and that one side of the ankylosis constantly threatens to ulcerate through the skin, the question may still be asked if amputation of the thigh and an artificial limb would not have been preferable. The



operation, therefore, is one whose utility may still be questioned at the present day, as it was at the time M. Denoue wrote his Thesis, (Paris, 1812.)

[The operation of excising the knee joint was revived by Mr. Fergusson, in 1850. His first patient died on the ninth day from acute necrosis of the femur, which also destroyed the one on which Mr. Syme operated in 1830. Mr. Fergusson's second case in Oct. 1852, was successful. His third patient, in Jan. 1853, died on the fourteenth day from purulent infection. Mr. Jones, of Jersey, appears to have had the greatest experience with this operation, having operated in no less than six cases, and with the exception in which one of his patients was carried off by dysentery, all seem to have been successful. A paper by Mr. Jones was read before the Royal Medical and Chirurgical Society of London, April 11th, 1854, which gave rise to a discussion of the question of the propriety of this operation. Mr. Fergusson remarked, that "his own conviction was, it is a proceeding as justifiable as amputation of the thigh, and far more beneficial, inasmuch as it saves the limb."

We give the details of Mr. Jones' first and sixth cases together with two successful examples by Mr. Mackenzie, of Edinburgh.

CASE 1.—A female, æt. 25. The operation was performed January 19, 1851. Unfortunately this patient was residing at a distant part of the island from St. Heliers, and during my short stay of a few hours I was unable to see her. Mr. Jones has furnished me with the following account of her present condition;—She is in perfect health, the parts about the knee having been long entirely healed. The shortening of the limb is a little over three inches. Complete ankylosis has not taken place, so that she requires a support on the inner side of the bone, with which she can move about freely, and can stand at her washing-tub for hours together. She is perfectly satisfied with her condition, and, with a more secure support for the knee, which is being made for her at present, the limb will be rendered still much more serviceable than it now is.

CASE 6.—William Livermore, æt. 12, was admitted into the Jersey Hospital on the 12th of October last, for an affection of the right knee, of upwards of a year's standing. His general health was not very much impaired, and the condition of the limb was—general inflammation of the knee-joint, and the textures surrounding it. A careful investigation led to the supposition, that ulceration of the cartilages had already much advanced. There was general distension of the joint, as if by contained fluid. A fair trial of the following means was carried out: The patient was kept in bed: the joint frequently covered with leeches; then cupping, blistering, mercurial and iodine frictions, tartar emetic ointment, each combined with appropriate constitutional remedies;—all failed. The operation was performed on the 17th of April last. A longitudinal incision was made on each side of the knee-joint, midway between the vasti and flexors of the leg, full five inches in extent; rather more than half the length was over the femur, and rather less than half over the tibia. These two cuts were down to the bones; they were connected by a transverse one just over the prominence of the tubercles of the tibia, care being taken to avoid cutting the ligamentum patellæ by this

incision; the flap thus defined was reflected upwards, the patella, its ligament, and the joint, thereby exposed. The synovial capsule was cut through as far as it could be seen; the patella and its ligament were now drawn over the internal condyle, while the joint was kept extended. It was next forcibly flexed, the crucial ligaments, almost breaking in the act, only required a slight touch of the knife to divide them completely; the articular surfaces of both bones were thus completely brought to view, and nearly two inches of the femur and half an inch of the tibia were sawn off, the soft parts being drawn aside by assistants. The external condyle of the femur was found hollowed out by a large abscess, and it was necessary to saw off a portion of the carious bone, and to gouge the remainder, until healthy cancellous tissue was reached. The entire synovial membrane was in a state of pulpy degeneration, and was carefully dissected off. The hemorrhage had been rather great, but had now almost ceased, and no vessel required deligation. The blood was sponged out of the wound, the patella (after the diseased portion had been gouged out) and its ligaments were replaced, as nearly as possible, in their natural state, the bones brought in apposition, the flap brought down and held by sutures, the limb bandaged on a slight under-splint and laid in a box, the wound covered with moist lint, and the boy put to bed yet asleep. The operation occupied full twenty minutes, and was performed while the patient was under the influence of chloroform.

Opiates had, for some time, to be freely administered every night; and the boy's appetite, always excessively small, having entirely failed, the stimulating plan of treatment was followed out more rigorously than I had pursued it in other cases. The seventh day after the operation, a slough of some extent was perceived on the lower part and sides of the flap. This went on increasing for some days; the ligamentum patellæ was, however, never bared. Mild, stimulating applications arrested its progress; healthy granulations sprang up; and soon the suppuration, which was at one time very considerable, lessened in quantity. At present it amounts to a mere nothing, the wounds being now all but healed.

Not seven weeks have yet elapsed since this operation was performed, and it is most satisfactory to witness its favourable and rapid progress. The little patient never experiences the slightest pain in any part of the limb; he turns it from side to side easily and quickly, and without either assistance or appliance of any kind, can, while lying on his back, raise the leg from the hip upwards. The knee bows slightly inwards; but my previous experience in these cases leads me to believe, that a very slight mechanical contrivance will entirely remedy this. The patella is adhesive to the femur and tibia, and its ligament preserves its integrity.

The integuments covering the joint had been so much deteriorated by the disease itself, and perhaps also by the remedies used, as, together with the length of the flap, to account naturally for the slough. Probably two smaller flaps, reflected upwards and downwards from the centre of the patella, might have answered better.

I am very unwilling to be supposed to recommend this plan of operation, as one adapted to all cases of knee excision,—very far from it;

there are cases in which it is altogether inadmissible; and I feel persuaded, that whoever adheres to one mode only, will often find himself wofully disappointed in the result. The general rule of acting according to the features the case presents, is quite as applicable to these particular cases as to others generally.

Preserving the patella, and not dividing its ligament, makes the operation more tedious and difficult; but this is a very secondary consideration, where it results in obtaining a more favourable issue. That it proved so in this instance is abundantly established by the fact already mentioned, that, in less than seven weeks after the operation, this patient is able to raise his foot without any assistance; while a young man who occupies the next bed, and in whose case everything has gone on favourably was only able to do so in as many months.—*Med. Times and Gazette*, July 1853, p. 11.

3. DR. MACKENSIE'S CASES.—CASE 1.—Wm. Harrison, æt. 42, a hostler, from Carlisle, was admitted under my care, in the Royal Infirmary, September 28, 1852, suffering under disease of the left knee-joint of five years' standing. The symptoms were those which are usually attributed to ulceration of the cartilages, uniform thickening of the parts around the knee, severe gnawing pain, especially during the night, and much aggravated by the slightest motion of the joint. Considerable relief was obtained by the joint being kept immovable in leather splints, and by the repeated application of the actual cautery. The thickening of the soft parts became diminished, and I hoped the patient was to recover with a stiff joint. A painful spot, however, remained over the inner side of the head of the tibia, on account of which the counter-irritation was continued, and the joint retained for a long time fixed by the leather splints. He continued in this condition till about the middle of January, when, without assignable cause, the pain in the knee, especially on each side of the head of the tibia, became much aggravated. The pain was now so severe and constant that, in spite of the free and frequently repeated use of morphia, he scarcely slept night or day. The swelling of the joint again increased, and the foot and leg became oedematous. On the 26th of January I called a consultation of my colleagues on the case, as it appeared to me that the removal of the disease by operation was alone likely to save my patient. It was thought, however, that a repetition of the same measures as had been already adopted, might still save the joint. The leather splints were accordingly readjusted, and the cautery once more applied in front of the joint. No relief, however, was obtained, and after ten days' further delay I yielded (with the consent of my colleagues, who saw the case with me) to the earnest solicitation of the patient, to remove the disease by operation.

The operation was performed, February 5, 1853. A straight incision was made across the front of the joint, a little below the level of the patella, and extending to rather less than half the circumference of the limb, and at right angles to each end of this transverse incision, a longitudinal incision of about two inches in length gave the wound somewhat the form of the letter H. The operation was performed quite according to the plan of Moreau, the patella being first removed, then the condyles of the femur, and lastly the articular surface of the head of the tibia. It was accompanied by smart hemorrhage from the articular



arteries, which was at once arrested by applying ligatures to them. On dividing the tibia with the saw, the cavities of two abscesses in the cancellated texture of the bone, were laid open, each of a size capable of containing a grape. I carefully removed the remaining portion of the walls of these abscesses with the gouge, and then, finding that the diseased portions of bone had been entirely removed, I placed the ends of the tibia and femur in apposition, united the wound by sutures, and fixed the limb in the straight position, by applying a splint on its posterior surface. (The articular surfaces of all these bones were found almost entirely deprived of cartilage; and both the cancellous and laminated structure of the bones, at various points, were in a state of suppuration and caries. The primary disease evidently consisted of suppuration of the cancellous texture of the head of the tibia. The extent of bone removed in the operation amounted to rather more than two inches—an inch and a half of the femur, and a little more than half an inch of the tibia.)

The progress of the patient for the first two days following the operation, was most satisfactory. He slept well, which he had not done for weeks before; his pulse never rose above 80; he expressed himself as entirely relieved from the severe pain which he had been previously suffering. On the evening of the third day he began to suffer from hiccough, which very soon became constant, and continued unmitigated by all the remedies which were employed to relieve it, for six successive days and nights. The spasm of the diaphragm at length yielded on the seventh day under the continued pressure of a seven pound weight, over the epigastrium, and the pretty free use of the tincture of Indian hemp, and everything went on favorably till about Feb. 23, when he began to complain of pain in the region of the diaphragm, and on pressure over the right hypochondrium. Obstinate diarrhoea succeeded, the evacuations presenting no appearance of bile. He lost all appetite, became desponding, as to his recovery, and lost flesh rapidly. The wound, however, during this time, never presented any unfavorable appearances. Primary union failed. but the discharge was moderate, and the entire surface covered by healthy granulations. In consequence of this constitutional disturbance, even at the end of four months osseous ankylosis was not complete, though in the opinion of Mr. Mackenzie two or three weeks would suffice for the purpose. His second case, was that of a fisherman, aged 28, suffering from disease of right knee-joint, of about ten months' standing. The affection had commenced, without assignable cause, by pains and swelling of the joint, which gradually increased; and, for two or three months previously to his admission into the hospital, had entirely disabled him from moving about. The condition of the joint was similar to that of Harrison, but the symptoms were less severe. The pain was considerably mitigated by the joint being kept immovable in leather splints, and by the repeated application of blisters. About a month after his admission into the hospital, the pain again became more severe, and was referred chiefly to the outer side of the head of the tibia. The actual cautery was freely applied, but without giving any relief, while increasing deformity of the joint, and pain on slight motion, gave evidence of the morbid changes which were in progress in and around the articulation. Shortly after this, he had an

attack of modified small-pox, from which he speedily recovered. No improvement, however, took place in the condition of the joint. He continued to lose flesh; the pain and the deformity of the joint continued to increase; and symptoms denoting suppuration of the joint presented themselves.

Sir George Ballingall, Dr. Dunsmure, and Dr. Gillespie, who saw the patient with me in consultation on the 2d of May, agreed with me in the necessity of performing amputation, or exsection of the joint, to either of which measures the patient willingly gave his consent.

I performed the operation of exsection of the joint on the 5th of May, 1853. Having found the disadvantages of the H-shaped incision in my first case, I now exposed the interior of the joint by a semilunar incision, extending from the inner side of the inner condyle of the femur to a corresponding point over the outer condyle, the incision passing in front of the joint nearly as low as the tuberosity of the tibia. The flap thus formed was dissected back, the *ligamentum patellæ* being divided, and the patella itself left in the substance of the flap. The rest of the operation was completed, as I have already described, with the important exception, that the patella was left in its place, and its immediate attachment left undisturbed. The cartilage, however, which remained on its surface was removed by the gouge, as well as the rough surface of bare bone around its articular margin. The amount of bleeding was very trifling: one of the articular branches and several small vessels were secured by ligature, and the wound was dressed and the limb supported, as I have already described in my former case. (The interior of the joint presented the usual appearances accompanying advanced strumous disease of the synovial membrane, suppuration of the joint, universal thickening and degeneration of the membrane, and ulceration of the margins of the cartilage in nearly their entire extent. Great part of the cartilage covering the articular end of the bone was as yet unaltered. Three-fourths of an inch of the tibia, and fully an inch and a half of the femur, were removed.) With regard to the progress of this case since the performance of the operation, I need only say that the patient has suffered as little local and constitutional disturbance as usually follows exsection of the elbow-joint, and certainly very much less than usually follows amputation of the thigh. He has been almost entirely free from pain, and has slept and eaten well, whilst his general appearance has been such that no one, who was unaware of the operation which has been performed, would, on seeing him, have imagined that he had undergone an operation which was dangerous to life. Nearly a half of the wound is already healed, and the remainder is covered by healthy granulations. The discharge, which has never been great, is already diminishing in quantity. There has not been the slightest tendency to displacement of the bones from the straight position,—a circumstance which I attribute, in a considerable measure, to the patella and its attachments having been left undisturbed. Little more than a fortnight has elapsed since the operation was performed, and I am, therefore, unwilling to say more of the case at present than that it promises, as far as it has gone, a most favorable result. There is one point, however, to which I wish to direct attention. It has been recommended that a considerable portion of integuments should be removed by a double lu-

nated incision, to prevent the redundancy of skin which might be expected from the large amount of bone removed in the operation. I believe that this advice, if followed, will lead to great annoyance. I have not removed any portion of integuments in cases the in which I have performed the operation, notwithstanding which, the retraction of the skin was such as to cause, in each case, more or less gaping of part of the wound. Mr. Fergusson mentioned to me that he had removed a small portion of integuments in the operation, in the case now in King's College Hospital, and that, during the patient's convalescence, he had much reason to regret having done so, as the retraction of the integuments was such as to leave part of the end of the femur uncovered, and a thin cicatrix only now covers this point of bone. (*Lond. Med. Times and Gazette*, July and August, 1853.)

Mr. Syme regards excision of the knee joint as "a dangerous and unprofitable proceeding." Now, with the cases to which our author refers, we have collected in all 28 cases. Deduct from this number, the 6 in the practice of MM. Fricke, Jæger, and Textor, the results of which are not mentioned, and we have 22 cases, and 7 deaths. The mortality therefore seems to be about the same as that following amputation of the thigh. As to the utility of the limb, after the operation, we subjoin the remarks of Mr. Henry Smith, of London, who has devoted much attention to this subject, and whose paper in the *Lond. Med. Times & Gazette*, for August, 1853, is worthy of attention.

There is still one point of great importance, in reference to this particular operation, which is to be considered,—viz., the utility of the limb as a means of progression after the joint has been excised, and a cure has been effected. The evidence on this subject, so far as it can be obtained at present, is on the one hand of a nature highly satisfactory, while on the other it is the reverse. In the remarkable case where Park first operated so successfully, the man returned to his occupation of a sailor, and "was enabled to go aloft with considerable agility, and to perform all the duties of a seaman;" surely this is more than could be reasonably expected. Mr. Jones wrote to me some time ago as follows concerning one of his cases:—"He walked without the assistance of crutch, stick, or any appliance whatever to the limb, up and down the largest room in the hospital, quite as fast as I could." On the other hand, Mr. Syme's patient did not, I believe, have much use of his limb eventually. Although the exact particulars of the condition and aptitude of the member have not lately been obtained, there is reason, however, to believe, that it is not satisfactory, as Mr. Syme has evinced great opposition to the operation.

However, there is no doubt that strong union of the parts in the site of operation does take place, and that, by careful attention to position, a very useful substitute for a sound limb may be effected. In some instances the union is only ligamentous, but in others it is bony, as was the case in Sir Philip Crampton's patient.

Here, however, the limb was not of very much use; and any gentlemen who will take the trouble to walk into the pathological department of the Hunterian Museum, and examine the large glass case on the basement floor will see the reason of this, for he will there find the preparation of the parts, and will observe, that the divided bones had become



joined by strong bony ankylosis, almost exactly at right angles. Sir Philip Crampton informed a friend of mine, that the limb had not been kept steadily in the extended position after the operation; thus arose the awkward ankylosis. But this case, instead of proving any thing against the operation, speaks much for it, as the parts are firmly knit together by bony junction. "And doubtless this union might have been effected in a straight position. The tediousness of the convalescence is another objection, to this operation, varying as it does from three or four weeks to as many months; but as Mr. Mackenzie observes, this period of time generally elapses before a patient, after amputation, can bear the weight of his body on the face of the stump." G. C. B.]

The following, however, are the principal processes which have been employed, and which may be adopted, should any motive induce us to attempt the operation.

A. *Process of Park*.—A crucial incision, whose transverse branch, placed above the patella, would comprise the half of the circumference of the limb, constitutes the characteristic feature of the process of Park. After having divided the tendons of the extensor muscles of the leg, and turned back the four flaps, raised up the patella, made the section of the lateral ligaments, and divided through the articulation from before backwards, Park inserted a large knife along the posterior surface of the femur, in order to detach the soft parts from it, while taking care to avoid the popliteal vessels. Nothing more remains than to saw the bone above the condyles; the extremity of the tibia is afterwards excised with the same precautions.

B. *Process of Moreau*.—The articulation of the knee being, in almost every respect, similar to that of the elbow, Moreau thinks that the excision of the one ought to be performed in the same way as that of the other. Consequently, he begins with two lateral incisions, a little in front of the borders of the ham, which incisions he unites by dividing transversely the skin and ligaments below the patella, in such manner as to penetrate down to the articulation; afterwards he detaches from the posterior surface of the bone, the soft parts which surround it; then dissects and raises up the quadrilateral flap circumscribed by the three first incisions; and afterwards performs the section of the femur, with the same precautions used in the process of Park. If the bones of the leg are also affected at the same time, the outer incision should be prolonged as far as the head of the fibula. Another is made on the crest of the tibia, by which means we have two lower flaps, one on the inner and the other on the outer side, which flaps are to be dissected and turned down. The posterior surface of the tibia is then to be isolated from the vessels and nerves, as well as from the origins of the gastrocnemii; and, finally, all the portions of the diseased bones are to be removed by means of the saw.

C. *Process of M. Bégin*.—In place of cutting at first a large quadrilateral flap, the new editors of Sabatier commence by a transverse incision below the patella, which extends from one lateral ligament to the other, and penetrates at once into the articulation. This being effected, the femur is disarticulated, or the tibia only, in case only one of the two bones should be diseased, by drawing two lateral incisions from the extremities of the first prolonging them upwards or downwards, to a

greater or less extent, according to the length of the portion of the bone which is affected.

D. *Manne* had already proposed the following operative process, to excise the head of the bones of the leg: "If the caries affects the upper extremity of the tibia, without invading the condyles of the femur, we may separate it from the patella and saw it off, as well as the upper extremity of the fibula, below the part affected. To effect this, *we make an incision more than semi-circular at the anterior part of the integuments, below the ligamentum patellæ*; we raise them up, divide the ligamentum patellæ, the anterior and lateral portions of the capsular ligament, and then the crucial ligaments; after which we detach the tissues adherent to the posterior part of the tibia and fibula, by directing the cutting edge of the instrument downwards and forwards, to avoid the popliteal artery and nerves. We then divide the periosteum circularly, and having drawn aside the tissues from the bones by means of a linen bandage or band, complete the exsection. If any portions of the semilunar cartilages are left behind, after dividing the capsule, they are also to be divided. The tibia and fibula are then to be approximated to the condyles of the femur.

E. *The Process of M. Syme* differs from those above, in more respects than one. The operator makes, in front of the articulation, two semilunar incisions, one above and the other below, which are united together on a line with the lateral ligaments, and circumscribe a transverse ellipse, including the patella; he then excises this ellipse and the bone which is comprised within it, divides the ligaments and opens into the articulation, and exsects in succession the diseased extremities of the femur and tibia.

### § III.—*Different Processes.*

In order to exsect the whole knee-joint, *Manne* (*Ouv. cit.*, p. 52, 1789) cuts an anterior quadrilateral flap which he extirpates. *Jeffray*, after making his two longitudinal and lateral incisions, finds it unnecessary to enroach to any farther extent upon the integrity of the muscles. When it happens that the patella has remained unaffected in the midst of the alteration of the other bones, as *Portal* (*Traité de l'Hydropisie*, t. II., p. 295 à 297) has seen in two instances, this process is one of the best that can be adopted. If the soft parts which cover or surround the patella are degenerated or destroyed by ulcers and fistulas, it may be found necessary to operate in the manner of *M. Syme*. I am not acquainted with the process by which *Filkin* has exsected the bones of the knee. *Park* led the way in sawing the femur before disarticulating it, and every one has since imitated him. But it was *Manne* who proposed to remove the extremities of the femur and tibia in mass, (*en bloc*,) without disarticulating them. The anterior quadrilateral flap being removed, and the tissues detached with the greatest care, "we divide, says he, the periosteum around the bones, which latter are then to be sawed above and below the articulation." This advice was forgotten and unknown. *Mulder* (*Wachter, De Articulis Extirpandis*, p. 34, 1810) adopted it without knowing that it had been recommended by others; and *Wachter* adds that the removal of the bones is thus

made with the greatest ease. M. Sédillot has succeeded equally well in applying the process of Manne or M. Syme to the elbow.

I have said above that Manne, in those cases where he had to remove only the carious extremity of the tibia, had, before sawing this bone, dislocated the articulation at the knee, a process indispensable under such circumstances. The head of the fibula, when it is not diseased, should be saved on account of the biceps. Park left it intact; Moreau, the son, (*Essai*, &c., p. 70,) was obliged to remove it.

#### § IV.

The *approximation* of the bones after the exsection must be left to the muscular action. This remark was made by Moreau, the son, with much reason. After the cure, the limb will require for some time the employment of a prop, encasement, splint, &c., in consequence of the tendency of the bones to be deviated into a false direction. It is equally important to prevent their riding upon each other. M. Syme has insisted the most and with the best arguments, on the necessity of exercising certain movements in the new articulation during the treatment; but the patients he operated upon were very young, and there is nothing to show that remedial means and time would not have cured more than one of these cases without the necessity of exsection.

In whatever way the operation is performed, the bleeding surfaces should be brought into contact and take the place of the bones that have been removed; points of suture, simple adhesive straps, lint and compresses, cushions and splints, in fact all the articles required in a compound fracture of the leg, are necessary to complete the dressing and to keep the limb in a state of the most perfect immobility.

All these processes will enable us to obtain the object we have in view. Whether we adopt the crucial incision of Park, or cut out a large quadrilateral flap like M. Moreau, or like M. Bégin penetrate into the joint with the first incision, or remove the patella or not, like M. Syme, the operation is practicable. It is, therefore, as I have said in the beginning, not in consequence of the manipulating process employed, but from the results which the operation may produce, that it becomes so formidable, and ought, in my opinion, to be generally proscribed. I would except those cases only where the articular surfaces alone are altered in such manner that we would be unable to remove the whole disease by excising an inch or two of each bone, as for example in the case of M. Jæger.

#### ARTICLE IV.—THE PATELLA.

If the patella alone were carious or degenerated, it should be removed without any hesitation, though we should have to open into the articulation. The Journal of Hygie contains an example of this kind, and the patient, it is said, was perfectly restored. I have seen two persons, who walk sufficiently well, though the fragments of their patella, which had been formerly fractured, leave an interval between them of more than four inches. M. A. Severin, (*Med. Efficace; Corps de Méd. de Bonet*, t. I., p. 313, §, 953,) being consulted by Father Mathias, who



was unable to go up and down stairs, from his patella having been fractured several months before, answered, that there was no other remedy, unless after having made an incision through the integuments, the fractured surfaces of the patella should be abraded, and afterwards bound tight together, adding, that this process was rude and unpleasant, but nevertheless necessary if he wished to recover promptly the function of the foot. But the patient refused to comply with this advice, and did well.

In the museum of the Faculty of Medicine, of Strasbourg, there is a skeleton in which the knee had no patella, (*Musée de Strasbourg* from 1820, p. 106, No. 219.) "I saw some years since," says Diemerbroeck, (*L'Anatomie du Corps Humain* t. II., p. 683, ch. XIX.,) "a German gentleman, whose patella was carried away entirely by a musket ball, and who thereby wholly lost the ability to walk. He was, nevertheless, in some sort restored here, in our village of Utrecht, by an artisan who applied to the knee an apparatus constructed of iron, by which the thigh bone was bound down and kept united to the tibia; so that when this instrument was adjusted, he could walk tolerably well. Nor could he ever, from the moment he laid it aside, advance the foot to make a single step, or even support himself a single instant.

In the following case they went farther:—The patella was fractured longitudinally, and the attempt at reunion failed; swelling and tension of the whole thigh, leg and foot succeeded, with apprehension of speedy mortification. Gelée (*Journ. de Méd. Milit.*, par Dehorne, t. IV., p. 503) being sent for eight days after the accident, judged that it would not be advisable to count on topical applications. Though the parts were dilated by incisions which specially implicated the tendinous and ligamentous attachments of the patella, the progress of the disease was not thereby arrested. The fever placed the life of the patient in imminent peril. Having remarked, says Gelée, that the strangulation was owing to the two portions of the patella, from their constant tendency to separate, drawing each of them respectively on the attachment of these bones, "I looked upon them as a double cause of the accidents which would not terminate unless one of the two portions was extirpated." One appearing to be sufficient to maintain the articulation, he removed the smallest portion, which was that on the outer side. The results of this singular operation proved successful. The swelling obviously diminished, and on the eighth day, it had quite subsided. The cicatrix was completed in six weeks, with permanent extension of the limb by ankylosis.

The fear of placing the articulation in contact with the air, was the reason why Theden (*Progrès ultérieurs de la Chir.*, p. 138) disapproved of amputation of the patella, "which was unfortunately performed," he says, "in a case of gun-shot wound, since, it resulted in gangrene and death." We have seen, says Percy and Laurent, (*Dict. des Sciences Méd.*, t. XLIII., p. 65) the patella separate itself from the knee, and have more than once removed it entire, without the patient having thereby lost the ability to walk. "If a dislocated patella could not be reduced, I would recommend," says Manne, (*Traité Élém. des Mal. des Os*, p. 347, 1789,) "that it should be removed, by making a longitudinal incision in the integuments which cover it, and then dividing transversely

above the base of the patella the tendon of the extensors of the leg, the ligament which attaches the point of this bone to the tibia, together with the membranous and aponeurotic portions which are adherent to its lateral surfaces. The extraction of the patella having been effected, the lips of the wound should be brought together, or kept approximated to each other, by maintaining for a length of time, the leg extended and the thigh flexed by means of suitable dressing." This operation, it would appear, was successfully performed in 1835 or 1836, by M. Thyron, a surgeon of Belgium.

#### ARTICLE V.—HEAD OF THE FEMUR.

White, (*Cases in Surgery*, 1770; or *London Med. Gazette*, March, 1832,) having, it is said, about the middle of the last century, removed the head and four inches of the femur in a child of fourteen years of age affected with coxalgia, and cured his patient, ventured to propose this operation as one that ought to be adopted in analogous cases. A simple incision on the outside of the thigh, enabled him to lay him bare the articulation, open the capsule, luxate the bone, and bring it to the external surface in order to perform its excision. Vermandois (*Journ. de Méd.*, t. LXVI., p. 49, 1786) and Petit-Radel (*Encyclop. Méth., part Chir.*, t. I.) revived this suggestion without modifying it. But Rossi (*Méd. Op.*, t. II., p. 225) soon perceived that the incision proposed by White would not answer, and that in order to arrive at the articulation, it was advisable to cut a triangular flap upon the outer side of it. Chaussier, (*Soc. Méd. d'Amul.* t. III., p. 399,) about forty years since, undertook a series of experiments upon this subject and upon excisions in general. According to him excision of the head of the femur in dogs is not much more dangerous than that of the humerus. There forms in place of the excised bone a fibro-cellular matter which afterwards becomes cartilaginous, and ultimately acquires a solidity almost equal to that of the osseous substance. Watcher in his dissertation maintains nearly the same opinions.

In 1831 I knew of but a single example of excision of the coxal extremity of the femur practised on living man. At that time I confined myself to the following language: "If the head of the femur should have escaped through the lacerated soft parts, and it became impossible to reduce it, we could unquestionably and ought to remove it with the saw, especially if it were fractured; but what disease is there of so grave a nature as to require excision of the bones, or that could attack this point without being propagated to the cotyloid cavity; and when the bone of the pelvis is implicated, what advantage would there be in excision of that of the thigh? If, however, it should ever be decided upon to undertake it, the most simple process, supposing that there was no wound at the exterior, would consist in cutting, by means of a semi-lunar incision, extending from the anterior superior spinous process of the ilium to the tuberosity of the ischium, a large flap with its convexity downwards and behind the articulation, at the expense of the tissues at the root of the limb. After the surgeon has raised up this flap and divided the posterior half of the capsule, he would be enabled by bringing the thigh into adduction and flexion, to divide the inter-articular

ligament, to insert the knife between the head of the femur and the cotyloid cavity, and to arrive on the inner side and in front upon the gorge of the neck of the femur, in order to detach from it what remains of the capsular ligament, and to bring out of the wound the whole of the portion of the bone we wish to remove. Nothing afterwards would remain to be done but to place the thigh back to its natural position, bring down the flap to secure it with the suture or adhesive straps, and to proceed in other respects as in compound fractures of the upper portion of the thigh bone."

At the present day I must speak in other language. A young girl, affected with coxalgia, had the haunch perforated with fistulas. The head of the femur having become movable, says Vogel, (*Bibl. Chir. du Nord*, p. 391, 393,) was extracted, and the child got well. In the case of another girl; aged fourteen years, mentioned by Schlichting, the opening of a pre-existing abscess was enlarged and the head of the femur then exsected with success. Are these the same, or other cases of destruction of the head of the femur, than those related by Ficker and Albert, (*Wachter, De Art. Extrip.*, etc.) According to M. Leopold (*Über die Resection*, etc., Wurtzburg, 1834,) this exsection has also been performed successfully by Kohler and M. Heine, of Wurtzburg. M. Schmalz, (Hedenus, *De Femore in Cavit. Cotyl. Amput.*, 1823,) of Pirna, in Saxony, also removed the carious head of the femur which had already separated from the rest of the bone. The boy was three years in getting well; the new articulation being formed by the great trochanter. M. Kluge (Wagner, t. IV., *de l'Encyclopédie de Bush*, Graefe) had also exsected the head of the femur in a state of caries; but the patient died two days after the operation. Brandisch (Simmons, *Journal de Médecine*, translated from the English, t. VI., p. 114, 1786) had also published the following case:—A wound of the thigh from a fire-arm. A portion of the head of the femur, representing about the whole extent of its upper half, came away in exfoliations. The patient got well. The limb which was scarcely any shorter than the other, could be brought into extension, and the patient use his limb, so as to walk with ease by means of a crutch. In the case of Schlichting, (*Transact. Philos.*, p. 284, No. 466, 1742; *Bibl. Chir. du Nord*, p. 392,) the cure was accomplished in six weeks, and the patient could walk with ease, but not without limping. M. Hewson, of Dublin, (Leopold, *Op cit.*, p. 16,) in the year 1823, in a case of caries, adopted the process of White, and exsected the head of the bone above the little trochanter. The patient died three months after the operation in consequence of purulent collections, which extended from the cotyloid cavity by means of an opening into the pelvis. M. Scutin (*Bull. de Thér.*, 1833; *Gaz. Méd.*, 1833, p. 165) in the year 1832, exsected the head of the femur, in a case of comminuted fracture from a cannon ball. The patient died in consequence of gangrene of the soft parts. It would appear also that M. Oppenheim (Leopold, p. 17, *Gaz. Méd.*, 1835, p. 183) once performed this operation at Schumla. Jæger and M. Textor (Leopold, *Op. cit.*, p. 17) also had recourse to it in 1834, at Wurtzburg, in the case of a boy aged seven and a half years, and who had fracture of the neck of the femur with abscess. The head and neck of the femur were removed, with two inches of the great trochanter. The child died at



the expiration of twenty-three days. According to M. Jæger, exsection of the femur would be indicated: 1, In cases where there were splinters of the neck and head of this bone or of the great trochanter from wounds of fire-arms; 2, In cases of fracture of the neck of the femur where suppuration and caries have supervened; 3, In cases of dislocations complicated with fracture and laceration of the soft parts; 4, In cases of ankylosis of the articulation where the limb could not be made use of; 5, In caries of the head of the femur in consequence of coxalgia, nor would it be contra-indicated then except there was at the same time caries of the cotyloid cavity or of the pelvis in general, and extensive purulent collections along the course of the femur.

[A diversity of opinion seems to prevail as to the operation of excising the head of the femur in cases of morbus coxarius. Mr. Syme denounces it under all circumstances. Sir Benjamin Brodie says, this operation should be performed "only in those cases where unequivocal advantage may be gained by it." Mr. Fergusson has performed it in at least four cases, and is of the opinion that under certain circumstances it may be resorted to with benefit to the patient, though he admits that thus far the experience on this subject in London has not been very satisfactory. Mr. Henry Smith, who has himself had an unsuccessful case, published some statistics of this operation, in the *London Lancet*. April, 1848. Of 16 cases which he had collected, in one half it had proved successful. In 3 of these, however, it was performed for a communicated fracture of the joint by a ball, necrosis from an old fracture into the joint, and in one case for caries of the great trochanter and neck of the femur. The acetabulum is not always involved, as was supposed by Mr. Ford, and as is even yet maintained by M. Syme. This was proved in the case in which Mr. French operated, where the disease was of long standing; and even if the cotyloid cavity be involved, we may, as did Mr. Walton, with a gouge remove the carious portion; for this caries, Prof. Syme assures us, does not affect the bone deeply. Again, this part possesses far greater reparative powers than the head of the femur, and may, if but moderately affected, undergo a spontaneous cure. A recent writer on Surgery, Mr. Erichsen, observes, that if the head of the bone still continue in its socket, the operation should not be undertaken. Now, if this rule be strictly followed, it will seldom be performed, for cases of dislocation are beyond all question very rare. We know of no writer who has more satisfactorily established this fact than Dr. March, of Albany. In his paper *On Coxalgia*, in the *Trans. Amer. Med. Association*, Vol. VI. 1853, he has collected evidence on this point sufficient to convince the most sceptical. M. Bonnet, in his *Traité des Mal. des Articulations*, Vol. II., pp. 394, 400, has shown how frequently mistakes have been made in this matter, and Mr. Fergusson agrees with the writers already quoted, that spontaneous dislocations in coxalgia are very rare. In the spring of 1847, we saw M. Roux exsect the head of the femur. The patient was a little boy who sank in two or three days after the operation. The cotyloid cavity and the great trochanter were found in a carious condition, the upper extremity of the femur was inflamed and surrounded by numerous large abscesses in the soft parts. In this case, the head of the bone, previous to the operation, was in its natural position. M. Sedillot, who is an advocate

for the operation, states (*Traité de Med. Operatoire*, Vol. 1st. p. 512) that in 1850, he saw at Wurtzburg, in the hospital of M. Textor, a young man on whom this surgeon had operated some years before, and who walked and bore his weight on the limb without difficulty. We believe that Dr. Bigelow, of Boston, has had a case which terminated fatally, but Dr. Sayre has been highly successful, although a portion of the socket, in a diseased state, required removal. Through the politeness of Dr. S. we have had frequent opportunities of watching the progress of this case, than which nothing could be more gratifying, or calculated to strengthen our confidence in the operation. G. C. B.]

### § I.

Leopold describes the operative process in the following manner; the patient is laid upon his sound side and the operator places himself behind him.

A. *First Stage*.—The articulation is laid bare, 1, by a simple longitudinal incision on the outer side of the haunch, or upon the trochanter itself, as was done by White, Park, Vermandois, MM. Hedenus, Syme, and Seutin; or 2, by a semi-lunar incision going round the great trochanter, as recommended by Jæger, and as I have mentioned above, or by dividing the gluteus maximus muscle, as recommended by Hewson, who also cut a semi-lunar flap about the great trochanter; 3, a posterior square-shaped flap, situated upon the outer part of the articulation, would be preferred by Percy and M. Roux; Jæger, who commences by a longitudinal incision at two inches or two inches and a half above the great trochanter, and which is to descend to three inches below it, adopts a triangular flap of five to six inches in length, which he completes by another incision of four inches in length, placed posteriorly and below in such manner as to divide the insertion of the muscles on the antero-superior part of the trochanter, while opening into the capsular ligament.

B. *Second Stage*.—The head of the femur is most usually removed by means of the common saw; but in muscular patients, Heine's saw would present some advantages.

C. *Third Stage*.—*Dressing*.—According to Jæger the union of the wound by the suture or adhesive plasters, and dressing with lint, compresses and a spica to the groin are injurious. This surgeon leaves the wound untouched, or unites it only at one part by a suture, and applies to it cold fomentations. The patient is to lie upon his sound side, with the femur and leg slightly flexed.

### § II.—*Appreciation*.

Without recurring to what I have said of it at first, or adopting in every particular the favorable opinion which Jæger has of this operation, and of which the thesis of Leopold appears to be an exact transcript, I will say then in conclusion, that exsection of the head of the femur stands in the same relation to disarticulation of the thigh, that that of the head of the humerus does to disarticulation of the arm. The modifications of the process also must be the same in both cases. More-

over, if White is in reality the first who recommended it, I am not sure that M. Coulon and Leopold have not, in the cases they attribute to this author, confounded the recommendation with the fact of the operation. To illustrate the effects of this exsection, experiments have also been made upon dogs by Vermandois, (*Ancien. Journal Méd.*, t. LXVI., p. 74,) Kohler, (*Exper. circa Regener. Ossium*, Goett, 1786, p. 84 et 94, Exp. XIV. et XV.) Chaussier, (*Magasin Encyclop.*, an V., t. VII., p. 248,) and by Wachter, (*De Articulis Extirpandis*, p. 91—94;) upon which subject Vermandois, (*Ancien Journ. Méd.*, t. LXVI., p. 70, 1786,) Rougemont, (*Bibl. Chir. du Nord.*, 1788, p. 392,) Petit-Radel, (*Encyclop. Méth. Dict. de Chirurgie*), Rossi, (*Médec. Op.*, Turin, 1806, t. II., p. 224,) Wachter, (*Œuvr. cit.*, p. 85,) Briot, (*Hist. Chir. Milit.*, p. 177, (817,) Jæger and Kluge, (Coulon, *sur la Carie*, p. 41,) MM. Seutin, p. *Œuvr. cit.*, p. 41,) Coulon, (*Œuvr. cit.*, p. 177, 178,) and Baudens, (*Ibid.*, p. 124,) are subsequent to White.

Briot, (*Ibid.*, p. 88,) who supposed that the idea of the operation first originated with him, and who wished to perform it on a child of thirteen or fourteen years of age, proposed to cauterize the earies of the cotyloid cavity, after having removed the extremity of the femur. M. Syme (*Hist. de la Chir. Milit.*, p. 177, 1817) regards the operation as altogether useless in cases of coxalgia, for he admits with me, that the cotyloid cavity almost always diseased at the same time, is generally affected to a greater extent than the femur. Moreau, the father, however, with the hope of removing the carious portions of the cotyloid cavity by means of the ehisel and gouge, proposed to two patients, in presenece of M. Champion, to perform upon them the operation of exsection of the femoro-iliae articulation; but they refused and recovered.

White, Vermandois, Petit-Radel, and Wachter, who assert that the touch in such cases is as sure a guide as the eye, confine themselves to a single incision. "The following, says Briot, is the method I projected for this operation: I would have made at the upper and outer part of the thigh a long and deep incision, the borders of which I would have held apart, and if necessary divided. I would have laid bare the upper part of the femur, divided transversely the capsule, and triangular ligament, examined the condition of the great trochanter, and respected the tendons which are inserted upon it, if I had found it sound; in the contrary case I would have divided those tendons, directed the knee inwards and the upper part of the thigh outwards; then with a small saw would have exsected the whole of the diseased portion of the bone. If I had found the cotyloid cavity carious or diseased, I would have immediately cauterized it; afterwards I would have endeavored, by means of the dressing and a bandage methodically applied, to place the femur in connection with the tuberosity of the ischium, with which I would have endeavored to make it contract an artificial articulation."

Rossi (*Méd. Op.*, t. II., p. 224) prefers a flap in L and not in V. M. Montfaleon (*Mém. sur l'Etat Actuel de la Chir.*, p. 103, Paris, 1816) also prefers this form of incision. M. Roux (*De la Résection ou du Retranch. des Portions d'Os Malades*, p. 49, Paris, 1812, in 4to) thinks that here, as at the shoulder, there is no necessity of economizing space; and that it would be preferable to make outside of the articulation a large square-shaped flap, adherent by its upper border, in the same man-



ner as Voehler or Puthod, and all these who have described the extirpation of the thigh before the time of M. Larrey, proposed that it should be made for this last mentioned operation. Percy (*Dict. des Sciences Méd.*, t. LXVII., p. 554) also recommends a square-shaped flap, and M. Champion has often seen Moreau, the father, go through the manipulation of exsection of the head of the femur, by means of an enormous quadrilateral flap, formed upon the outside. But the semi-lunar flap which I have recommended, and which M. Bégin (*Nouveaux Elém. de Chir.*, Paris, 1838, t. II., p. 821) adopts, is I think preferable to all the above forms of incision.

## SECTION ELEVENTH.

### TREPHINING.

Trephining appears to have been practised from the remotest antiquity. Its origin is lost in the night of time. It is performed on almost all the bones of the body, particularly in connection with their exsection; but more especially upon the bones of the cranium.

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### CHAPTER I.

#### ARTICLE I.—THE CRANIUM.

Trephining, notwithstanding the improvements which it received from the physicians of ancient Greece, and its relinquishment in the middle age to that species of charlatans whom Sylvaticus denominates *circulatores*, is one of those operations which, since the time of Guy de Chauliac, have more especially occupied the attention of surgeons. For a long time it was believed to be the principal and only remedy for accidents which supervene from blows, falls, and most of the traumatic lesions of the head. Panaroli and F. de Hilden (*Bonet, Corps de Méd.*, t. II., p. 374) applied the trephine for a simple chronic cephalalgia, and Marchettis for epilepsy, M. A. Severin, who formally advises trephining in this last case, is sustained by the example of Sala, Boucher, De La Motte, M. Dudley, and M. Unger, (*Encyclogr. des Sc. Méd.* 1838, p. 171.) a surgeon of Chateau-du-Loir, whom I saw operate in 1813, have since done the same thing. M. M. Guild (*Rev. Méd.*, 1829, t. IV., p. 301) and Warren, (Communicated by the author, 1837,) in these latter times, assert and they have also each performed this operation with success (for epilepsy.) The epilepsy however reappeared in the young man operated upon by M. de Renzi, (11 *filiatre sebezzi*, Oct., 1837.) A wound in the sinciput was followed by vertigo and paralysis; Scultetus (*Arsen. de Chir.*, p. 23, obs. 13; *Dict. des Sc. Méd.*, t. I., p. 15) applied two crowns of the trephine at the expiration of nearly two hundred days, and cured his patient. A man mentioned by Wepfer, caused his cranium to be perforated with a wimble by a blacksmith, who thus cured him of an ancient cephalalgia: Fractures of the internal ta-

ble of the bones, which Garengnot has so often spoken of, and attrition and simple contusion of the diploe, have also been ranged among the cases which require the employment of the trephine; but we must take care not to go too far in such cases. M. Ramsden, who ventured to perforate the frontal bone for a simple supra-orbital pain, saw his patient die on the fourth day from meningitis, and I could easily cite other similar unfortunate cases. What I have said of excision of the cranium renders it unnecessary for me to treat at length of the trephine, the more so as I have elsewhere (*De l'Opér. du Trépan dans les Plaies de la Tête*, etc., 1834) considered all that appertains to this last-mentioned operation.

[Dr. Dixon, of this city, reported in the *Boston Medical and Surgical Journal*, August, 1846, a case of neuralgic affection of the cranium cured by trephining. G. C. B.]

### § I.—Indications.

The object of the trephine is to give egress to the foreign liquids which may have become effused in the cavity of the cranium, to allow of the removal of splinters which have penetrated into the brain, and the extraction of any extraneous body whose presence might interfere with the cerebral functions.

A. *Fractures*.—Nothing is more vague than the signs by means of which authors pretend to recognize the various lesions which require trephining. The sound of a cracked pot and perforated at the moment of its fall, or that which is emitted by bones when they are struck by a small stick, as mentioned by Lanfranc, are altogether insignificant. It is the same with the inclination of certain patients to carry the hand mechanically to some determinate point of the cranium; the concussion experienced by others at the moment when a piece of linen which they compress between their teeth is suddenly snatched from their mouth; and the painful sensation they experience in making a long inspiration, and upon which Roger, of Parma, has so much insisted. All those signs may fail though there exists a fracture, and on the contrary, may be present in lesions infinitely more unimportant. Besides, it is not the fracture properly so called, but rather the compression which it has caused, which should justify the operation of the trephine.

B. The presence of *effusions*, whether sanguineous or purulent, is also equally difficult to ascertain. We may especially find it extremely embarrassing to identify their situation. Sometimes it is immediately underneath the point injured that they are formed, sometimes at the point diametrically opposite, and frequently also at a less remote distance from this point. The paralysis which indicates that the injury is situated on the opposite side of the cranium, may be found to be on the corresponding side, (Bayle, *Rév. Méd.*) If the integuments of the cranium are not altered; if no contusion or division is observed there, it is almost impossible to determine (*prévoir*) within half an inch, and often within several inches, what is the precise locality of the effusion. The application of a cataplasm over the whole head, as recommended by the ancients in order to ascertain which part of this topical application should become dry the soonest, and which would correspond to the part

diseased, is a puerile resource, the exact value of which has long since been properly appreciated.

C. On the other hand, as it has been found that *collections* though they were considerable, have been absorbed (*se dissipent*) without trephining; as fractures with depression (*l'enfoncement*) of near an inch, a case of which kind has been related respectively by M. Jannin, (*Bull. de la Fac. de Méd.*, t. VI., p. 498—509.) Physick, MM. Horner, Pailard, Graefe, Ribes, &c., have nevertheless, not prevented certain patients from recovering without an operation, Desault and his school, contesting the doctrine of the ancients, and of Garengeot, J. L. Petit, De Quesnay, Pott, and the entire Academy of Surgery, and falling back upon the ideas of Van Wyck, Aitken, and Metzger, have with good reason established as a general position, that the operation of the trephine is rarely necessary, and often injurious, and that we ought in consequence to dispense with it, in a great number of cases where the surgeons of the last century recommend it. This doctrine, which is sustained by the researches of Briot, and which is advocated by Professor Graefe, at Berlin, and adopted by the English surgeons, has generally prevailed in France, where it has found a zealous, in fact, an extravagant champion in M. Gama.

D. Some respectable practitioners, however, M. Larrey, M. Roux, Dupuytren, Delpech and others, have on several occasions used the trephine with success at the Hospital of the Garde Royale, La Charité, and the Hôtel Dieu of Paris. Bécларd and M. P. Dubois were not less fortunate in a case of fracture without displacement, though they had been obliged to apply three crowns of the trephine on the temporal fossa, and to extract nearly eight ounces of blood furnished by the middle meningeal artery. M. Toussaint, in 1825, published a similar success which he obtained by means of six crowns [*i. e.*, six applications] of the trephine, and I have elsewhere shown (*Opérat. du Trépan dans les Plaies de Tête*, etc., 1834) the little value [to be attached to] of most of the arguments invoked against the trephine by its most zealous opponents.

Thus without being as prodigal in the use of the trephine, as was the custom before the time of Desault, and without absolutely admitting with MM. Foville and Flourens, that it may be useful in protecting the organ from compression in the inflammatory and other fluxions of the encephalon, it appears at least, that it ought to be had recourse to more frequently than it actually is at present. If it be true, that we are often embarrassed in recognising the seat and nature of the diseases which indicate it, it is not the less so, that in some cases the difficulty is not placed beyond the reach of an intelligent practitioner. Moreover the patients, when it is decided upon to employ it, are in so alarming a state, that a simple perforation of the cranium cannot add much to the dangers with which they are threatened. If then we should have become positively assured by any means whatever, that a foreign body, splinter, angle of bone, or extravasation of fluids are the cause of the unpleasant symptoms noticed, then ought we to trephine; the same must be done for those effusions, ancient or consecutive, which are announced by the necrosis of the bones, the separation of the pericranium, the dark color of the surrounding tissues, the pale aspect of the lips of the wound, the crepidation of the integuments of the cranium, &c.



A sailor received a blow on the head, which was followed by fracture of the cranium and compression of the brain. The trephine was employed, and the patient was cured, (Filleul, *Gaz. Méd.*, 1833, p. 47.) A depression of the cranium kept up a paralysis. M. Warren (communicated by the author, 1837,) had recourse to the trephine, and cured his patient: A lock of hair which had got folded back upon the duramater, during the accident, afterwards became firmly imprisoned between the edges of the fracture. As no cerebral accidents had supervened I waited: symptoms of compression and meningitis now came on. The trephine was used but the inflammation continuing unsubdued, death ensued. I would have operated sooner, had not M. Rey, (*Thèse* No. 79, Paris, 1834, p. 99,) in a similar case seen a cure take place after the formation of a sequestrum.

[The trephine has been frequently employed by American surgeons in the treatment of epilepsy, and Dr. Stephen Smith has furnished us with an interesting statistical paper on the subject in the *New York Journal of Medicine*, &c. for March, 1852. Of 27 cases, there were unrelieved, none; relieved, but not cured, 3; immediate relief after operation, 2; relieved when seen at the end of a month, 3; between one and six months, 3; between six months and one year, 6; between one and five years, 3; set down cured, but lapse of time from date of operation to time last seen, not given, 7.

Among the causes, we have, external violence to the head, 24; serofulous caries of cranial bones, 1; unknown, 2.

Appearances.—Thickening of bone, 7; fracture, 6; both tables, 4; inner table, fractured, and driven in, 2; spicula of bone, 5; no morbid appearances, 1.

But little more than a century since, several insane patients in Swift's Hospital, Dublin, were trephined, on the supposition that their insanity was produced by the brain having become too large for the cranium!

G. C. B.]

## § II.—*The parts of the Cranium which admit of the application of the Trephine.*

The operation being once decided upon, another question presents itself: upon what region should the instrument be applied? It was formerly established, that the trephine should not be applied above a *horizontal line* which would separate the base from the vault of the cranium, by passing near the *nasal process* [of the temporal bone,] and on the external *occipital protuberance*; nor upon the sutures, nor track of the *sinuses* of the dura mater, or *frontal sinuses*, nor on the *temporal fossa*, *antero-inferior angle* of the parietal bone, &c. Notwithstanding which, Béranger de Carpi, Cortesius, Hoffman, Bromfield, and Pallas, have trephined opposite the sutures with entire success; while Aerel, Wurm and many others have perforated the frontal sinuses with good results. We shall moreover find (under Tumors of the frontal sinus) that the trephine is frequently required for the peculiar diseases of those cavities.

[In the *British and Foreign Medical Review*, January, 1846, there is an account of a remarkable case in which Dr. Wuth, of Vienna,

trephined the frontal sinus for the extirpation of a polypus from that region. The operation was successful, though the healing of the parts occupied twelve months, when the osseous cavity which had been enormously distended by the morbid growth, returned nearly to its normal form. A full report of this case may also be found in *Ranking's Abstract*, Vol. III. p. 114. G. C. B.]

Warner, Marchettis, Garengéot, Sharp, Pott, Callisen, Mosque and Lassus, have laid open different sinuses of the dura-mater, without anything unpleasant resulting, and the experiments of M. Flourens on animals, go to prove that this may be done almost without any inconvenience being thereby produced. [See Remarks of Dr. Mott on this subject, Vol. I.]

Carcano, and Job à Meekren, had already had the boldness to trephine upon the temporal fossa, without regarding the lesion of the fibres of the temporal muscle, while Bilguer, Copland, Gooch, Abernethy, Hutchison, and Giersh, have laid bare the brain in perforating the occipital bone. When we apply the trephine upon the sutures, either the body to be extracted is found immediately underneath, and then their adhesions have necessarily been destroyed, or the seat of the difficulty is not there, and then the operation should be performed upon another point.

M. Larrey, Boyer, M. S. Cooper, and C. Bell, have remarked, that upon the frontal sinuses, we shall be enabled to avoid wounding the membranes, by commencing the operation with a crown larger than the one that we are to terminate with. Moreover what danger would there be in wounding the dura mater? When we open into the venous sinuses of the cranium, the hemorrhage which was so much dreaded by the ancients, generally ceases of itself, or at least by means of simple tamponing. [See remarks of Dr. Mott, *supra*, on wounds of the sinuses of the brain, Vol. I., and on hemorrhage of large arterial trunks in this Vol. II. T.] On the external occipital protuberance there exists no other arterial branches of any considerable importance except those of the occipital; and the lesion of the trapezius, or complexus muscles which are attached to these protuberances, can be of no consequence. In the temporal fossa, the section of the muscle, in whatever way it may be effected, interferes in no wise with the restoration of its functions. As to the wounding of the meningeal artery it could easily be remedied, by means of a pledget of lint drawn from the interior to the exterior of the cranium by means of a double thread to be fastened outside upon another pledget, as was done by Physiek, or by means of cauterization with a probe heated to a white heat as practised by M. Larrey, or by a plug of cork pierced in its centre, or by a piece of wax, or a plate of lead bent in such manner as to compress the two sides of the bone and the furrow which contains the artery, to which vessel a ligature was on one occasion successfully applied by Dorsey of Maryland.

Sabatier, reviving the precept of Lanfranc, recommends placing the crowns of the trephine near the depending point of the extravasation. As it is almost always practicable by changing the position of the patient, to incline the opening into the cranium downwards; as we more frequently have recourse to the operation in order to extract a foreign solid body, than to give issue to liquid matters; and as it is rare that

the effusion has any considerable extent, this precept is less important in practice than might be at first imagined.

### § III.—*Dressing.*

Hippocrates speaks of a rasp known under the name of *xistre*, with which he scraped the bones, that he might thin them, or recognise their cracks. His trephine was a sort of gimlet, acting in the manner of a drill. He speaks however, of another also, which must have had some analogy to the crown-piece which was described at a later period. Celsus gives to this crown the name of *modiolus*; without doubt says Guy de Chauliac, because it resembled a small wine *measure*. He compares the trephine, properly so called, to the carpenter's auger. Galen is the first, who speaks of *abaptistes* trephines, *i. e.*, with crowns or perforators, provided with a border or sheath, which prevents them from penetrating too deeply. These *abaptistes* which are found mentioned in the Works of Lanfranc, and of a great number of other surgeons, have been long since proscribed from practice. A lenticular knife, the gouge and chisel, as well as the *méningo-philax*, a sort of stem terminated by a flattened button, and used for inserting the pledget of lint, between the dura mater and the bones at the time of the dressing, had been already employed in the time of Heliodorus and Galen. We find, moreover in the work of André de Lacroix, cutting pliers, screw-rings, and elevators, as well as the suggestion of the famous triploid, recommended by Scultetus, and the disadvantages of which J. L. Petit took particular pains to point out.

The articles used now, and which are usually contained in what is called a *trephine case*, are a trephine, properly so called, with its shaft and crowns, a screw-ring, a central pin, and its key, various elevators, a lenticular knife, a chisel, cutting pliers, a crested saw, a small brush, and a leaden mallet. The trephine and demi-trephine, which the English and many German surgeons prefer, should also make a part of this case. At the present day, the osteotome-saw of M. Heine, and the turning-saw of M. Thall, could readily replace the ordinary trephine, if they were cheaper, or more easy to work with. I have described farther back the cases where we should have recourse more especially to the rowel-saws of MM. Martin and Charrière.

We are indebted to Dr. Samuel S. Purple, senior Editor of the *New-York Journal of Medicine*, &c., for the following illustration of a new trephine, the advantages of which we give in his own words.

"Several years since, owing to difficulties that arose in the operative management of a case of severe and extensive injury of the head attended with depression of, and extravasation of blood under, the cranium, in a near relative, I was led to engage in a series of experiments which at last resulted in the construction of the instrument represented in the accompanying illustration.

The several parts of this instrument, and their use, may be described as follows: The crown part of an ordinary trephine (Fig. *a.*) attached at right angles to a straight handle (*b.*) having a hinge joint. (*c.*) \* A

\* This is the joint represented in the engraving, although a button joint that will admit of more motion, may be used at the option or fancy of the manufacturer. The joint for the attachment of the different sizes of circles or half circles may be easily modified, if desired.



centre pin (Fig. 2 *d.*) with a sliding handle (Fig. 2 *e.*), which handle can be moved freely, up or down, and which, when attached to the instrument rests its shoulder (Fig. 2 *f.*) upon the upper surface of the crown portion. The object of this movement is to allow of pressure, more or less, being made upon the crown portion by the operator's left hand, as occasion requires. The lower part of the centre-pin (Fig. 2 *g.*) is screw-shaped, which on being inserted as far as is deemed necessary into the bone remains stationary and serves to fix the instrument; it also answers all the purposes of forceps for removing the detached portion. In order to use the instrument it is necessary for the operator to place the centre pin in the crown portion (as represented in Fig. 1.) and then fix its screw point into the bone; after this, grasp the sliding handle in the left, and the handle of the instrument proper in the right hand, place now the handle at a right angle, by bending the hinge joint, then pull and push the handle in the same manner as in using the ordinary amputation saw. By so doing the crown portion will traverse one-third of the arc of a circle, or even more if desired, with perfect ease and uniformity.

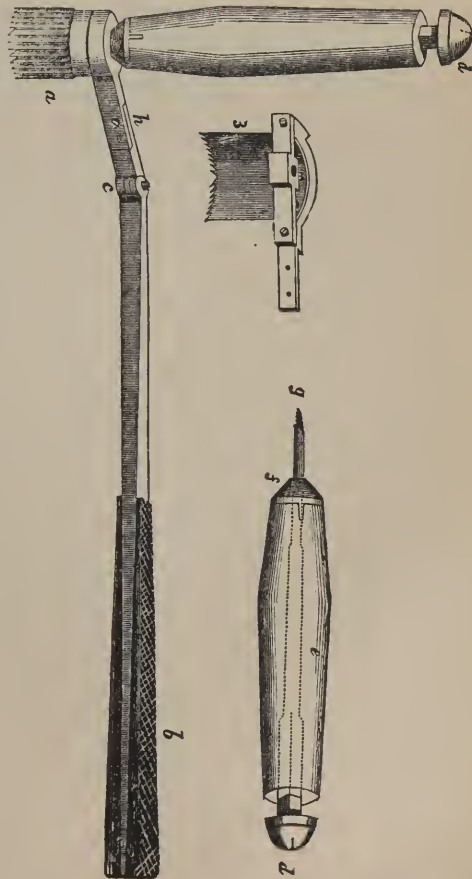


Fig. 1 The instrument entire with the centre pin attached ready for use.

" 2 The centre pin with sliding handle.

" 3 A half circle to be used in place of Hey's convex Saw, in most instances.

*a.* Crown part like that of an ordinary trephine; *b.* handle of instrument; *c.* hinge joint; *d.* centre pin attached and detached; *e.* sliding handle of centre pin; *f.* shoulder of centre pin; *g.* point of centre pin, screw shaped; *h.* point at which the handle can be separated, so as to allow of attachment of different sizes of circles and half circles.

The drawing represents the instrument one-half the original size.

This instrument is intended as a substitute for the trephine of the present and trepan of former times. But as the former instrument has almost if not entirely superseded the latter, it is only necessary for us to confine our remarks to this, while instituting a comparison of their respective merits; and in doing so it will be seen by examining the engraving and in using the instrument, that it differs from the ordinary trephine, 1st, in the mode of applying the motive power; 2d, in the freedom and ease of working it; 3d, in its uniformity of action; and above all, 4th, in the consequent less liability of injuring the brain and its coverings.

It is believed that if there is one operation more than another that the experienced surgeon approaches with dread, it is that of applying the trephine, in cases which necessitate its use. This dread lies not only in the acknowledged fact of the extreme delicacy of the operation, but also in the fatigue to the operator which *accompanies* as well as *follows* its performance. But by the instrument here represented the motions of the operator's hand and arm are the same as those produced in the use of the amputation saw—a movement which we believe has never (at least to our knowledge) been brought to bear upon this class of instruments before. If we mistake not, one of the greatest difficulties in the way of using the trephine is the almost utter impossibility of keeping the instrument in a vertical position as respects the plane of the surface to which it is applied, while performing the movements of supination and pronation of the fore-arm. With the instrument just described there is no difficulty of this kind. The detachment of the motive power, as well as that by which the pressure upon the saw is made, from the centre pin, does away with all such irregularity, and admits of any amount of inclination being given to the saw, in the direction that the operator may please; and that too without the possibility (almost) of the operator becoming fatigued, or incurring, by so doing, increased liability of injuring the brain or its investments. This feature has long been a desideratum in the action of this instrument, and is one, it is believed, which will do away with some of the greatest difficulties and inconveniences and dangers of the operation of trephining.

But it is in the use of the half circles that the superior adaptation of this instrument will be seen. Take for instance a case of fracture attended with depression of bone, and extensive injury of the membranes and brain—the depressed portion being movable, but not sufficiently so as to admit of being extracted. Here the application of a full circle would cause greater depression and perhaps consequent increased injury of the soft parts beneath. In this case the half circle may be used without the least danger of causing motion of the depressed portion or injuring the soft parts. Here, then, the indications meant to be, but never answered by Hey's convex saw, are satisfactorily fulfilled. It is the writer's conviction of the value of the foregoing facts, from experience, that has led him to place this short and imperfect account of the instrument before the readers of the *New-York Journal of Medicine*."

G. C. B.]

#### § IV.—Operative Process.

The patient being in bed, and having his head resting upon a small

pillow, beneath which should be placed a plate (*planche*) or large metallic vessel, is held in this position by the assistants.

*A. First Stage.*—The operator, provided with a straight, thick, and sharp bistoury, more or less dilates in different directions, the wound, should any exist. In the contrary case, an incision whose shape has undergone much variety, is made upon the integuments of the cranium, which have been previously shaved. Lanfranc, Guy de Chauliac, and Lassus, recommend that it should resemble a 7 reversed. V. Swieten prefers that it should have the form of an X, and that its flaps should be excised. In general, we employ the T or crucial incision.

When we operate on the temporal region, cotemporary authors, following Sabatier and M. Richerand, advise that it should have the form of a V, with its base above, since according to them, we divide in this manner a very small quantity of muscular fibres. I see nothing censurable in this mode, only that it appears to me that there is a delusion as to its advantages. If the apex of the V comprises a transverse section of the temporal muscle, of less extent than its base, we nevertheless divide all the fibres included between the two extremities of this last.

It is now a long time since the circular and triangular incisions, and all those in which the flaps were extirpated, have been recommended by any one. Whatever Pott may say of it, the crucial, (*en croix*) incision is that which is preferred. For myself, I should prefer the semi-lunar incision, which allows of our raising up and letting fall the flap upon the cranium as everywhere else.

When we have no apprehensions of encountering fissures, the bistoury may be carried down to the bones with the first cut. The flaps being raised up, protected by fine linen, and held back by the fingers of an assistant, the next step recommended is to destroy the pericranium with a rasp. This is a useless, and even an injurious precaution. The pericranium in no wise interferes with the action of the trephine. The wounding it with the saw is not more dangerous than that which is made by tearing it with a rasp. In using the crown of the trephine at once, we lacerate it only on the circle which is necessary, whereas the rasp separates it always to a certain extent beyond that, which must evidently expose to necrosis; it would be better to divide it circularly with the point of the bistoury.

The vascular furrows even which had already been pointed out by Hippocrates, as calculated to lead to the mistake of the existence of a fracture, would not be effaced by it, (the rasp,) especially if they coincided with the abnormal depression of a frontal protuberance, and should present a certain depth, as I saw at La Pitié, in 1831. It would evidently afford no assistance in distinguishing from a true fracture, the lateral suture, which is sometimes found on the parietal bone, the deviations of the sagittal suture mentioned by V. Swieten, Quesnay, Bontius, (*De Medecinâ Indorum*, Obs. 10, p. 37,) and Manne, (*Obs. de Chir.*, etc., p. 505, 1729,) or the arrangement of the wormian bones, which came near deceiving Suncerotte. Nevertheless, if we desired to make use of this instrument, it would be necessary to grasp its handle with the right hand, and to embrace its shaft with the thumb and fore-finger of the left hand; then, by means of combined movements of the two



hands, to manipulate with it in such a manner as to prevent its slipping or denuding the bones more than is desirable.

B. *Second Stage*.—When we make use of the *trephine*, of which M. Withusen has proclaimed himself the champion in Denmark, the surgeon embraces its handle with both hands and makes it act in the manner of a drill or cork-screw. If, on the contrary, the *trepan* is preferred, its crown is adjusted upon it, after which the operator grasps its shaft with the right hand in the manner of a writing pen; directs the point of the centre-piece upon the centre of the portion of the bone which is to be removed; presses on the crown to mark this point, while the other hand supports the rest of the instrument; removes the crown immediately after; puts in its place the perforating trepan, the apex of which is applied upon the point marked out by the centre-piece; embraces by means of the thumb and finger of the left hand, united in a circle, the ebony plate which terminates the handle of the trepan; presses on this plate by means of the chin or forehead; seizes with the right hand the body of the shaft of the trepan; causes it to turn two or three times from right to left; refixes the crown in the place of the perforator; reapplies the instrument as at first; fixes its centre-piece in the hole which he has just made, and makes this immediately turn as before, while taking care to make pressure equally on all the teeth of the free border of the saw, in order to excavate a circular groove as regular as possible.

As soon as this groove is sufficiently deep to hinder the crown from escaping, the centre-piece should be removed: otherwise it would render the operation more tedious and dangerous. As it goes beyond the level of the crown, it would necessarily arrive upon the membranes before the section of the bones was completed. As soon as the trepan is again replaced in its first groove, the surgeon makes it act with rapidity while it is yet at a certain distance from the dura mater, withdraws it from time to time, to see if the section is made with regularity, and to cleanse its teeth with the brush, and also, as Hippocrates had remarked, to prevent it from becoming too much heated; gradually afterwards relaxing its motion as soon as it traverses the layer of the diploe, the operator tries from time to time, by means of the elevator, to raise the osseous disc circumscribed by the crown, and finally ceases to act with the trepan when he hears a cracking sound, which it is impossible for those who have ever heard it, to mistake for any other, and which indicates that we have reached the membranes. The bones of the cranium were so thin in a child, says Pcu, (*Pratiqu. des Accouch.*, p. 197,) that the trepan penetrated suddenly into the brain. In a patient, mentioned by Sellier, (*Bibl. Chir. du Nord*, p. 130,) the perforating trepan must have penetrated to 18 lines into the substance of the brain, without causing any accident! The osseous plate, when it is completely divided, comes out sometimes at the same time with the crown. In the contrary case, we pry it out with the point of an elevator, which we use as a lever of the first kind.

C. *Third Stage*.—If the cut is smooth it is useless to employ other instruments to regulate the contour; but as there are often found some points or sharp lamellæ at its deep-seated portion, it is the custom to apply the lenticular knife to these, the button attached to which is kept

between the dura mater and the bones, in order to make its cutting edge pass round the entire circumference of the aperture which has been made. If we have reached the seat of the evil, the liquid matters begin to flow immediately. If it is a solid foreign body, we remove it with the forceps or any other appropriate instrument. Sometimes we perceive that the extravasation has extended to some distance beyond the point upon which we have operated. When it consists of coagulated blood or any other plastic material, a single crown is insufficient to give it exit; in that case we should not hesitate to apply a second or even a third. The destruction of a large portion of the vault of the cranium should not intimidate us when it seems indispensable. Solingen says, the Prince of Orange bore the application of the trephine seven times without inconvenience. Spigel relates a similar case. V. D. Viell speaks of a case in which the trephine was used twenty-seven times. Thus, as we have seen above, M. Toussaint effected a cure after the application of six crowns in a patient whose case he communicated to the Academy, as Cullerier, (communicated by the author to M. Champion,) had done in another. All the world, moreover, know the facts cited by Blégné, Saviard, and Lavauguyon, in which it is seen that almost the entire vault of the cranium was destroyed without causing death. A patient of Sand, (*Th. de Haller*, t. I., p. 97,) had in this manner an opening in his head of six inches circumference, and that of Vigaroux, (*Opusc. sur la Régén. des Os*, p. 127,) had lost the greatest portion of the frontal bone. Many Theses of Strasbourg contain facts not less remarkable.

D. *Fourth Stage*.—When many crowns are applied with the simple view of obtaining a large opening, it is no longer the usage to leave between them a species of bridges which were to be broken up by the strokes of the chisel, as was done by many surgeons of the middle age. We arrange them, since the time of Z. Platner, (*Institut. Chir.*, § 160, *et Hist. de Sprengel*,) in such manner that the circumference of one shall extend as close as possible upon that of the other, in order that nothing may rest between them but angles more or less salient, and which may be readily removed by the cutting-pliers. If we renew the perforation of the cranium, because the first has not fallen on the extravasation or foreign body, this is a second operation to be performed, and which must be conducted upon the principles laid down above. When the morbid collection is found immediately underneath the bones, nothing should induce us to divide the dura mater. But when the fluids are extravasated more deeply, we are no longer fearful since the time of Glandorp, of incising this membrane. We should not, however, do this except in cases where plausible grounds exist to assure us almost with certainty that we shall come down upon the seat of the difficulty, that is to say, where there exists a darkish, livid or yellow tint, and a protrusion more or less considerable of the external membrane.

This division is effected by means of a bistoury, the point of which is held perpendicularly to the extremity of one of the principal diameters of the osseous opening, in order to bring it to the other extremity without making it penetrate any deeper. The advice has also been given to incise the substance of the brain in cases where no fluid is found between the membranes. In support of this, authors cite a number of

facts, among others a case observed in the practice of Dupuytren, who had the courage to plunge the bistoury more than an inch deep into the brain. In three lines farther, M. Bégin, who had already reached more than an inch deep into the cerebral substance, would have fallen upon an enormous abscess! [Those desirous of perusing the account of a *very heroic* performance of this kind, may find it recorded in the *American Journal of the Medical Sciences*, January, 1850, p. 86. G. C. B.] Such conduct, however, should be but very rarely imitated. When extravasation has its seat in the substance of the brain, how are we to know where it is to be found? Is it not in such cases almost always the effect of an internal cause? By what sign should we recognize its presence, even though it should correspond to the opening of the bones? Doubtless a simple puncture of the brain, even though very deep, might not cause death, or even give rise to any thing more than slight accidents; but as the contrary is equally possible, it could never be without trepidation that the prudent surgeon, would decide upon dividing in this manner the substance of the encephalon. In some cases, the extravasation is as it were separated into several portions, by bridges, adhesions or partitions. If this condition could be anticipated, we ought not to confine ourselves to the application of a single crown, but apply two of them, one on each side, as has been advised for example, when we operate in the neighborhood of the sutures or the track of the venous sinuses. When trephining is employed to extract or remove splinters, the operation exacts some special modifications. In the first place, the point of the centre-piece should be applied upon the border of the bone which presents the greatest solidity, while the crown at the same time is directed upon the two sides of the fracture. Afterwards, as soon as the effusion is removed, nothing remains but to attend to the splinters or depressed portions of bone. We detach every thing proper to be removed, either by means of the forceps or cutting-pliers, but never, unless in a case of necessity, by the aid of a chisel, gouge or mallet. To raise up the parts that have been merely displaced, we have recourse to levers of different forms. The tripod of the ancients, the triploid elevator of Scultetus, an instrument similar to the screw-ring of the Coopers, are no longer in usage. The elevator, armed with a bridge, as proposed by J. L. Petit, (*Nouv. Elém. de Chir.*, t. II., p. 679;) and the same instrument as modified by Louis, are alike rejected. All surgeons at the present day confine themselves to the simple elevator, a shaft of steel about six inches long, curved in the form of an italic S, garnished with the teeth of a file upon the concave surface of its extremities, which last moreover are flattened in the form of a chisel or spatula. In a case of necessity, in fact, this last lever could be replaced by the ordinary spatula. Frequently, in cases of fracture, we may, by introducing a chisel or some other instrument into the crack, produce a sufficient separation of the bones for the effused fluids to escape outwardly, so as to render the application of the trephine, properly speaking, unnecessary. In fractures with considerable separation, and in simple widening of the sutures, a remarkable example of each of which, as noticed in an adult, has been given by M. Robert and M. Goubert, we should dispense with perforating the cranium unless the fluids are effused opposite to some other point. To remove a necrosis, splinter, or solid foreign body, implanted in the cranium, the osteotome of M. Heine, with which M. Demmé, (*Gaz. Méd.*,



1834, p. 644,) of Zurich, had already obtained six successful results in 1833, would be much preferable to the trepan, properly so called. In the absence of this instrument we may in the same cases make use of the flat or convex saws; but to give egress to the liquids effused into the cavity of the brain the crown of the trepan still has the preference.

E. *Fifth Stage*.—The *dressing* at the present day is much more simple than formerly. We no longer use in practice those oils, tinctures, balsams, and unguents, of which M. Bertapaglia alone had devised more than thirty varieties, and of which the ancients were so lavish. The gold plate of nuck and that of lead recommended by Belloste, are also forgotten. Practitioners at the present day are satisfied with a disc of fine linen, traversed in its centre by a noose of thread which serves to keep it outside, and which is inserted with care between the dura-mater and the bones, by means of the meningo-phylax, a spatula or simple button-probe; in other cases this dossil is advantageously replaced by a small fine compress, besmeared with cerate and perforated with holes. Its middle portion is inserted into the aperture of the bone, while the remainder covers the inner reversed surface of the flaps and the whole wound. The cavity or species of purse which results from this, is filled up with small balls of lint which are covered over by one or more plumasseaux. Some compresses are afterwards placed over these, and the whole is maintained by means of a bandage, which the surgeon arranges sometimes in one manner and sometimes in another, or by a simple triangular handkerchief, or the *couvre-chef* of Galen, or better yet by an ordinary cotton cap, or *serre-tête*, or, as Heliodorus had already recommended, by a net-work of hair, which the Spaniards use under the name of *reddizella*, and which is worn among us as a head-covering for young girls. [For most of these forms of head-dressings, see Vol. I. T.]

Mynors and M. Maunoir recommend that there should be no portion of dressing used in the opening in the cranium, but that the integuments should be brought together and kept in contact by means of adhesive plasters. Blount and Herlioh, who have given the same advice, say they have followed it with success. Others have gone still farther. A personage is mentioned in whom a portion of the cranium had been replaced by a corresponding piece taken from the cranium of a dog; and M. Maunoir thinks the opening made by the trepan could be filled up in this manner! It would appear even that this unnatural transplantation, which was made trial of in Germany, has been attended with some successful results. (See Vol. I.) To me it appears evident that the approximation of the borders of the wound, would not prevent the effusion of a certain quantity of fluids between the dura-mater and the scalp. It is moreover, most usually desirable to leave the solution of continuity open, to give exit to the effused fluids, and to enable us to cleanse the morbid cavities a sufficient length of time after the operation. [For Dr. Mott's views on this subject, see Vol. I.]

## § V.

The *consequences* of trephining exact no care which may not easily be obtained for the patient. The dressing should be renewed every day, once or many times, if the abundance of the discharge appears to re-

quire it. When the suppuration is dried up, and the cerebral affection has disappeared; when, in fine, nothing remains but the wound of the operation, we proceed to hasten its cicatrization. Consequently we endeavor to approximate its borders, and treat it in other respects like any other simple wound. This cicatrization presents some peculiar phenomena. Sometimes the circumference of the opening of the bones becomes attenuated and seems to approximate to its centre, to become ultimately blended with the dura mater and the envelopes of the cranium. At other times especially when the opening into the cranium is very large, its borders only become blunted and rounded; cellular granulations rise up from the fibrous membrane, gradually fill up the aperture formed by the crown, become more and more solid, and ultimately agglutinate with the exterior soft parts, from whence results a real plug of which Duverney has preserved a very beautiful specimen. Whatever may be done, there generally remains after the cure, a sufficiently deep depression upon this cicatrix, the slight thickness of which sometimes allows of the movements of the brain being perceptible externally.

In such cases it has been also recommended, in order to prevent cerebral hernia, to keep applied upon the cavity which I have just mentioned, a convex disc, or plate of lead, or any other metal. To show the necessity of these sorts of plates, Monro mentions the case of a young girl, who thinking she might dispense with one which she had worn for a long time, was soon seized with cerebral accidents of which she died at the expiration of five days. As metallic substances readily become charged with caloric, it has been apprehended that among those persons especially, whose position in society obliges them to remain exposed to the rays of the sun, they might give rise to serious accidents. At present they are replaced by pelotes of leather or boiled pasteboard which are adjusted like the pelote of hernial bandages.

If a necrosed plate of bone should continue imprisoned in the soft parts in such manner as to resist, as has been sometimes observed, the action of the forceps, we must then, after the manner of J. L. Petit, lay it entirely bare and isolate it, and raise it up and extract it by means of an elevator or any other lever. Colomb. (*Obs. Méd.-Chir.*, etc., p. 263) thus laid bare and was enabled to remove a necrosed portion of the inner table of the cranium. M. Gerard (*Thèse*, p. 53, Strasbourg, 1802,) was less fortunate with an imprisoned necrosis of the whole thickness of the bone; Guenot (*Ann. Journ. de Méd.*, t. XVI., p. 37) professes to have successfully removed on one occasion the whole frontal bone, together with the ethmoid and some plates of the nose! In a patient mentioned by Hevin (*Pathol.*, t. II., p. 171) the internal table only on reaching it with the trepan was found carious. In young children, and even in some adults, instances of which are related by Morgagni and Pestalozzi, (*Lettre à un Méd. de Province*, p. 65, 1747,) the cranium is sufficiently thin to enable us to perforate it by scraping it with a rasp, as is recommended by many authors. The crested saw, or one of the small ones of Hey, should replace the crown, if we have nothing more to do than to remove some salient angle of one of the borders of the fracture. If the necrosis should not extend through the whole thickness of the bone, or if the morbid collection was situated between the two tables of the cranium, the rasp or the perforating

trepan would doubtless be sufficient, and we should be on our guard against penetrating as far down as to the dura-mater. But wherever the disease extends down to the membranes, it would be dangerous to follow the advice of Hippocrates, by leaving at the bottom of the opening an osseous lamella, however thin it might be, and counting on its exfoliation to give the effused fluids an opportunity of escaping externally.

De La Motte (*Tr. d'Accouch.*, t. II., p. 1062,) remarked that on the separation of the sequestrum the meninges were found covered with fleshy granulations, which protect them, he says, from the vitiated air of the Hôtel Dieu of Paris. The bones of the cranium, isolated from the dura mater and pericranium, do not die, says Abernethy, (*Journ. de Litt. Méd. Étrangère*, t. II., p. 341,) but in proportion as they are separated to a great extent. This is a remark, the truth of which I have often had an opportunity of corroborating, especially at the tender age of life, and it is one which, though it justifies trephining in cases of necrosis, should nevertheless deter us from deciding too hastily upon this operation. I will add to the instructions which I have elsewhere given (*Opérat. du Trépan*, 1834, in 8vo.) upon all these points, that in some cases detergent or any other kind of injections, according to the indications, will serve to hasten the cleansing of the morbid cavity as well as the rest of the wound, and that it would be improper to neglect their employment.

#### [INJURIES TO THE HEAD.]

*Concussion.*—Mr. Guthrie (on *Injuries to the Head affecting the Brain*, Lond., 1842) differs from the opinion of some, that a diminution of the size of the brain, or its subsidence from the interior of the bones of the cranium, is the cause of sudden death after concussion. He justly cautions against the practice of bleeding, or strong stimulant drinks, or strong stimuli to the nose; for the patient is pulseless, motionless, of a deadly paleness, &c., all the reverse of sanguineous congestion; so that bleeding would be fatal, or injure even after the circulation begins; and stimulating drinks might strangle him, while stimulant salts to the nose would probably subsequently give rise to inflammation of the nasal passages and throat. He therefore, in such cases, recommends *mild* stimulants and *disagreeable* smelling substances, with partial as well as general friction with the warm hands, until it is ascertained that life is extinct. Vomiting is a favorable symptom, because it shows reaction has commenced. If the breathing should continue constantly stertorous, it is a proof of continued irritation, or of compression and extravasation, rather than of concussion.

Too much bleeding, early in compression, will bring on convulsions and syncope, contracted pupils, deadly paleness, and *breathing on the right side of the mouth for a few minutes, with the whiff or puff so peculiar in cases of compression of the brain.* At the moment when the stage of depression is slowly passing into that of excitement, it would be hazardous to bleed over five or six ounces. When excitement or inflammation has fairly begun, and the patient, though disposed to coma, is, when roused, still irrational and impatient, we must not temporize with blisters or purgatives, but proceed to bleed the patient, to



whatever extent required to abate the symptoms; and this is to be done to nearly fainting, and *while he is sitting up*, the latter part of which injunction, says M. Guthrie, is far more important than most persons suppose, as we may see strikingly illustrated in apoplexies. This bleeding must be steadily repeated as the symptoms recur, until relief is obtained, or until the powers of the patient can no longer resist the disease or the remedies. In robust persons, two hundred ounces of blood have been thus abstracted with benefit in two or three days.

*Fractures of the Cranium.*—Mr. Guthrie, (*Op. cit.*, *Injuries of the Head*), in all his vast experience of fractures of the cranium in military and civil life, has never actually known the inner table to be separated from the outer, without positive marks of an injury having been inflicted on the bone or pericranium, however slight that injury may have been; and although it is not possible to doubt the fact of fracture of the inner table alone having occurred, we should be cautious not to let any prepossession of this kind get hold of our feelings, or the trephine may be injuriously resorted to without cause.

In the cases of a clean division of the sealp and outer table, as by sabre-cuts, &c., without fracture, he recommends antiphlogistic means and immediate reunion by first intention. When the instrument even penetrates to the diploe, this practice is to be preferred, though there may be some slight exfoliations, and that the external wound may not unite by the adhesive process. If the instrument has penetrated through the inner table, this, as is well known, will generally be found to be broken, always to a greater extent than the outer, and to be separated from it and driven into the membranes or brain, though on the surface of the bone the edges may appear to be merely separated. The most careful and thorough probing is here required to ascertain the true state of the parts, as even where the fragments are driven into the brain, the patient may only complain of being slightly stunned, saying that he is not much hurt, and that he will be well in a few days. Otherwise the patient may, as in a case he gives, (*Op. cit.*, p. 85—87,) be, even as late as the fourteenth day, when all is supposed to be going on well, seized with paralysis and coma, ending in death—showing, on dissection, a fragment of the inner table, separated from the diploe and driven through the membranes into the brain, where it had caused suppuration. In all such cases, the trephine or the straight saw must be used, if it be only in anticipation of the symptoms mentioned.

In depression from fracture of the skull in a *child*, however, the inner table is not *brittle*, but bends equally, and does not break; it very often does little mischief when depressed, and gradually recovers its level. The brain in young persons is also softer and more compressible, and can therefore bear more; consequently the trephine, under the age of fifteen or sixteen, must be used with caution, as it is also a well known fact, continues M. Guthrie, that, in the records of surgery for the last twenty years, the greater number of successful cases of recovery from depression, or from fracture and depression of the skull, which were not trephined, were in young persons. M. Guthrie gives a case of a small child, who fell over the bannisters of a house in London and fractured the parietal bone, producing such a remarkable hollow or depression, that it might have held the half of a small orange. At first in-

sensible, it shortly after gasped, the next day was leeches and purged, and soon was enabled to walk about quite recovered, the hollow still remaining for several weeks. Neither the trephine nor any other means than those mentioned were had recourse to. The long bones in children, also, rather bend than break.

[Dr. Jas. L. Van Ingen, of Schenectady, has reported in the *New-York Journal of Medicine*, May, 1854, an interesting case of trephining in infancy. The patient was but *twelve months* of age. It fell upon a "tenpenny" nail sticking in a board, and became imbedded upon it, the nail entering the brain to the depth of two and one quarter inches. The accident occurred at 6 P. M. Sept. 20, 1847. Convulsions, and sinking followed on the 21st, at noon of which day, "the skin was cold, there was no pulsation perceptible at the wrist, and but feeble at the carotids." On exposing the bone, a small irregular opening was discovered, sufficient to admit the passage of the nail, the sides of which gradually approximated at the bottom, the nail having entered obliquely. The portion of bone represented in the cut *c* was then removed with the trephine, and on its inner surface both tables were found depressed as shown in the cuts *b* and *a*.

(a) A lateral view of the portion removed, showing the actual amount of depression.



(b) An internal view of the portion removed, showing the two small portions of both tables of the skull depressed.



(c) An external view of the portion removed, being a portion of the right parietal bone near the parietal protuberance, showing the opening in the bone, caused by the entrance of the nail.



The operation was followed by an immediate improvement in the condition of the child, and in a few days had entirely recovered. We saw this patient in (c) April, 1854, and found that the opening made with the trephine was nearly closed with bone.

This case shows that even in very young children the trephine may be indicated, and that even though the brain be softer, and can accommodate itself to pressure more readily than that of the adult, yet the most urgent symptoms may arise, which can be relieved only by an operation. G. C. B.]

Trephining in crowded hospitals is dangerous, as probably one out of ten, Mr. Guthrie thinks, would, under such circumstances, die from inflammation of the brain and its membranes, &c., Mr. Guthrie does not, according to a modern suggestion, [which finds its germ, we presume, in sub-cutaneous surgery. T.] consider such results imputable to the admission of air. He thinks inflammation of the dura mater, and formation of pus between it and the bone, was much more common from injuries of the head in the time of Dease and Pott than since. He has rarely seen the secondary tumor described by them; and the same remark was made to Mr. Guthrie by the surgeons of the hospitals of London, of whom he made the inquiry, (*Loc. cit.*, p. 122.)

M. Aran (See *Archive Gén. de Méd.*, Janv., Feb., et Mars, 1845; also *Gaz. Méd. de Paris*, Juin 7, 1845, p. 364—365) combats wholly

the ancient and still prevailing opinion of fractures of the cranium, by what are called *contre-coups*; i. e., where the base, for example, is fractured by a blow on an opposite or distant part. M. Aran classes all these fractures by *contre-coup* under two heads, viz.: 1st, Those that are *independent*, i. e., where the part struck as well as the distant one are both fractured; 2d, Where the fracture is produced by *irradiation* or prolongation, from the place struck and fractured to the base of the cranium, for example. The sutures, he thinks, present but little resistance to these. In fractures of the cranium from falling on the feet, he thinks it is the effect of the direct concussion transmitted through the whole column, from the feet to the head. The thin bones at the base of the brain, he thinks, escape these *contre-coups*, by yielding when the percussion is transmitted from a distance, whereas, if it had been direct, they would have been shattered. So in the squamous portion of the temporal, &c.; whereas, the more solid bones of the vault of the cranium would be likely to fracture by their very unyielding density.

M. Aran has made a number of experiments on the heads of dead subjects, striking them with hammers, &c., or precipitating them from certain elevations *head-foremost*. These are some of his principal conclusions: He has never known a fracture at the base without one at the point struck also; in other words, he has seen no fractures by *contre-coup*, so called, at this region; that these fractures generally arrive at the base of the cranium by the *shortest curve*, i. e., the shortest radius; that fractures by irradiation from the base, constitute ninety-nine out of one hundred of fractures at this part; that those consecutive to percussions and fractures on the frontal bone are found, by his experiments, to terminate generally in the anterior third or upper floor of the base; those of the occipital bone, in the posterior third or lower floor; those of the temporal bone in the middle third or middle floor; while those on the sinciput may follow one of these three directions, but their tendency is to the middle fossæ.

*Fracture of the Petrous Portion of the Temporal Bone. Hemorrhage from the Ear, &c.*—A new Anatomical Point of Diagnosis suggested.—A case recently occurred to M. Blandin, at the Hotel Dieu, Paris, (*Annales de Therapeutique*, Mars, 1845; Cormack's *London & Edinburgh Monthly Journal*, June, 1845, p. 461, etc.) of a man aged thirty, who in a fall fractured the petrous portion of the temporal bone, causing hemorrhage from the left ear and mouth, slight defect in the hearing, and slight paralysis of the muscles of that side of the face, with paralysis also of that side of the uvula, to such extent that it was drawn to the sight side of the base of the tongue, by its muscles on that side now having no antagonists. This case has apparently established an important, but hitherto obscure, point in anatomy, and thus furnished a new diagnostic mark in pathology in such fractures. The coincidence of paralysis of the face with that of the velum palati in several such cases (but not always) had been noticed by M. Monteau. It is known that the uvula receives its nerves from the sphenopalatine ganglion by three filaments, which go from this ganglion to the uvula and velum. But the ganglion itself also receives a filament from the intra-cranial portion of the facial nerve, as has been shown by MM. Blandin and Longet. This, however, had been *erroneously* supposed to be a filament



sent from the ganglion to the vidian nerve; whereas, it is now found to be a distributor of nervous influence from the vidian nerve to the uvula and velum. From whence we have the *key* to the condition of these parts in the fractures in question, and the explanation why lesion to the intra-cranial trunk of the facial nerve must produce paralysis in the filament which goes to the spheno-palatine ganglion, and afterwards leaves it as the *motor* nerve of the uvula. The uvula, consequently, is only paralyzed when the cause of the paralysis of the face is within the cranium, close by the petrous portion of the temporal bone. Therefore, we have this valuable diagnosis: when there is paralysis of the face alone, without accompanying paralysis of the uvula, we may affirm that the lesion is external, or in the peripheral branches of the nerve. The hardness of hearing is sufficiently explained when the injury is within the cranium. M. Blandin considers hemorrhage from the nose and mouth in such cases as unequivocal signs of fracture of the petrous bone; the blood emanating, he thinks, from the interior of the tympanum, where it is extravasated and escapes anteriorly by the external ear, (which presupposes rupture of the membrana tympani,) and posteriorly by the Eustachian tube, through which it finds its way to the throat. M. Blandin has verified these conclusions, by repeated dissections.

Dr. Laugier, (*Archiv. Gén de Paris*, Août, 1845—see also Ranking's *Half-yearly Abstract*, &c., Amer. ed., New-York, 1846, Vol. II., pp. 84-5-6,) after remarking upon the usual *discharges* of blood from the ears, nose, &c., which for centuries surgeons have usually halted at as a sufficient mark of the mischief within; shows by attending to the modern and more minute and thorough modes of post mortem investigations of organic lesions and structural changes, that after the discharge of blood on the immediate occurrence of contusions and fractures of the cranium, (as on the vertex from a fall, &c.,) there will be also frequently found a remarkably large and constant discharge of *watery* serum from the ear, sometimes to the amount of *half a pint*; and that this limpid fluid denotes fractures of the os petrosum, with or without displacement and laceration of the dura mater, but *with* laceration of the membrana tympani. The fluid being, as Dr. Laugier supposes, the *serosity of the blood*, which, after the hemorrhagic extravasation within the brain has coagulated, filters as it were through a chink (or mere fissure—displacement of the fragments of the fracture not being essential) in the os petrosum into the cavity of the tympanum, and thence into the external meatus. [Doubtless the same fluid oozes also through the eustachian tube into the fauces. T.] A similar serous discharge may also ensue into the nasal passage from similar *fracture-cracks* [as they may be called. T.] in the *orbital plate* of the temporal bone, that of the *ceribriform plate of the ethmoid*, and the *sella turcica* of the sphenoid bone.

From the whole of the cases which have been examined, Dr. Laugier infers: 1. That the appearance of the watery fluid in the ear always indicates fracture of the petrous portion of the temporal bone, but with hardly any appreciable separation of the pieces from each other. 2. That an effusion of blood between the dura mater and the bone is constantly observed over this fracture. 3. That laceration of the membranes of the brain is not essential to the production of this symptom. 4. That

if the fractured portions of the petrous bone be separated a line or two from each other, blood alone continues to be discharged from the ear, but no watery fluid.

The fluid cannot be that of the cerebral cavities, but is the serosity of the effused blood, squeezed out by the pressure and motions of the brain, and filtered through the narrow fissure. The objections to this opinion are: 1st. The quantity of watery fluid which sometimes escapes. 2d. The differences observed between the fluid and the serum of the blood. In one case nearly twenty ounces were discharged in three days, and in another ten ounces in forty-eight hours. This appears too large a proportion to the coagulum found under the fissure, but the latter, having been subject to compression, is found almost dry, which at least proves it to be one source of the fluid. In wounds of the soft parts, with effusion of blood into the wound, when this ceases to flow externally, a serous discharge, which saturates the lint and compresses, succeeds, and this is exactly what happens in the case of the ear. Dupuytren always concluded, from the appearance of this watery discharge from deep wounds, that hemorrhage had taken place within. In both cases it comes from the effused blood, and also from the lacerated vessels themselves, after they have ceased to pour out blood. The fluid from the ear differs chemically from serum, in containing a double portion of chloride of sodium; and, although heat and nitric acid produce no coagulation, shreds of coagulated albumen or fibrin are observable in it; but Dr. Laugier does not consider the analysis sufficiently exact to confer much weight on any objection that might be raised. That the origin of the fluid is not from the natural cerebro-spinal fluids is obvious, from the membranes of the brain being in many cases uninjured. That it is not the fluid of Cotugno is plain from its quantity, and from the fact that in many cases the openings of the internal ear remain intact.

On the other hand, Drs. Lawrie and King have recorded *twenty-two* cases of cerebral concussion (Cormack, *Loc. cit.*, p. 462; also same Journal for 1843, p. 673) at the Royal Infirmary of Glasgow, in which there was hemorrhage both from the ear and mouth, and yet *twenty* of these cases recovered, and in one only of the two fatal cases was there fracture of the base of the cranium found on dissection. Dr. Cormack (*Ibid.*, *Loc. cit.*) speaks of three similar cases, all of which were cured, and which place in doubt the opinion that hemorrhage from the ears and throat, even where it is abundant and accompanied with violent concussion and alarming cerebral reaction, as it was in all these cases, is a conclusive evidence of fracture of the petrous or any other bone. In one only of these three patients there were both paralysis of the face and deafness; but the uvula was not examined. Dr. Cormack considers in fact that fractures even of the petrous bone may recover.

M. Gerdy (*Ib.*, *Loc. cit.*, p. 463) is stated to concur also in the belief that the hemorrhages in question do not always indicate fracture.

Again, in the *Annales de Thérapeutique* of Paris, for May, 1845, (See also Cormack's *Lond. and Edinb. Month. Journ.*, *Loc. cit.*, June, 1845, p. 463, &c.,) we have three illustrative cases at La Charité, two belonging to M. Gerdy himself, and one to our author M. Velpeau. In the first a stout young mason received only slight contusions apparently

on the head from a fall from a scaffolding, and was stated to have been at first insensible for a few minutes. For three days there had been, it was said, abundant hemorrhage from the right ear, which continued on his admission into the hospital the evening of that day, also slight head ache, strong pulse and hot skin. After two or three venesections and doses of tartar emetic [!] and antiphlogistic regimen he left the hospital well. The discharge from the ear had ceased on the fourth day, and it was found that the membrane of the tympanum had been ruptured, as the air hissed out freely through it, in making an effort to blow with his mouth and nose shut. There was no palsy of the face, deviation of the uvula, or other symptom of compression, which latter M. Gerdy considered would have resulted from accumulation of blood at the base of the cranium, had there been fracture of the petrous bone.

The second case was also a robust young man who fell down stairs and struck the right temple. He was almost insensible, and the ear on that side soon discharged blood and became slightly deaf. On the fourth day after the accident he was admitted into the hospital, and was found to have a large bloody tumor on the temple. The discharge of blood from the ear had ceased; the deafness continued; the pulse was hard, and the patient complained of a throbbing head-ache on the side which had been struck. There were, however, no symptoms of compression, and no facial paralysis or deviation of the uvula; nor was the membrane of the tympanum torn. So that the blood must have come from the outer ear. M. Gerdy cannot think there was fracture in this case.

The third case was that of M. Velpeau, of which we regret to have met with no other details except that the patient was admitted on account of various injuries, and had a discharge of blood from the ear, which however was not apparently connected with any deep-seated lesion.

The editors of the Paris Journal in which these cases are given, (*Annales de Thérap.*) conclude from all the above facts, that in the present state of science, hemorrhage from the ear under the circumstances described, does not permit us to pronounce that a fracture exists, even though the hemorrhage may be accompanied by paralysis of the face and uvula.

It is to be borne in mind that in fractures of the os petrosum of the temporal bone, the diagnostic mark of deviation of the uvula to one side by the preponderating antagonism of the muscular fibres on the sound side, cannot take place (unless through the muscular fibres of the velum) if what M. Lisfranc says (*Clinique Chirurgicale de la Pitié*, Paris, 1842) that this projection is sometimes destitute of any deep fibres.

*Fracture of the Frontal Bone and Depression.*—It is true, nature can and will at times make apparently almost more than superhuman efforts in the work of reparation to the organization, even where she has had to contend (as the ancient fable has it) against the fearful alliance both of empiricism and the disease. But this is no argument why we should, with a full knowledge of our duty, stand by idle, and compel and torture her to put such powers to the test. Thus with the indisputable truth before us so often demonstrated, that a depressed portion of a fractured bone of the cranium will almost inevitably cause either immediate rupture of the vessels of the brain, with convulsions, coma and death, or



subsequent extravasation, separation of the dura mater, inflammation, and suppuration, and death in that shape also ; and with the extraordinary fact that a recovery may take place, and leave the patient ever after subject to epileptic convulsions ending in idiotey ; how, we repeat, with this knowledge before us multiplied in ten thousand examples, and with the knowledge also of the equally established precept in surgery, that all these accidents in ninety-nine out of one hundred cases have no other chance of cure than by the elevation and excision of the depressed fragment, can we conscientiously look silently on and see a case of this kind pass on through this fearful ordeal of symptoms without at once applying the needful remedy ! Yet such appears to have been the fact in the case of a boy, aged 5 years, described by Dr. Pinefoy of Clogh-jordan, Ireland, (See *London Lancet*, Dec. 28, 1844, p. 400.) This little patient, with a fracture of the frontal bone an *inch long* and depressed a *quarter* of an inch, caused by the kick of a horse, and most unequivocally pronounced, was allowed by this physician to pass during the subsequent days through acute inflammation and fever, with violent convulsions, coma, apoplectic stertor, &c., he employing only two slight venesections, a few leeches, and some calomel, and above all the *douche of cold water* let to fall upon the vertex from a height of two feet, to which dangerous experiment (as we deem it) he attributes the cure—aided by the recuperative powers of nature in young subjects ! This truly is a fearful mode of demonstrating pathological possibilities, and an abuse, as it seems to us, of the principles of *conservative surgery*.

*Compression*.—Mr. Guthrie (*Op. cit.*, Injuries of the Head, &c., London, 1842, p. 40) correctly, in our judgment, considers compression not, with Sir C. Bell, the result of a diminution in the quantity of blood in the brain, but rather of a plethoric state of the vessels of that organ, and of some integral change caused in the whole volume of the brain and its functions by such compression, as from a clot of blood or depression made by a *mere point of bone*, &c., in fracture, the removal of which immediately removes the coma, &c., while an *ounce of lead* may lie quietly in the brain without causing any unpleasant symptoms. Hence it is not so much the actual pressure, as Sir C. Bell, Serres, Gama, &c. think, that causes these symptoms, as it is *irritation*.

Mr. Guthrie gives as an example of this truth some cases of compression he has seen, wherein the pulse was remarkably quick (145) till life ceased, accompanied with paralysis of the *left* side, and the *whiff-like breathing* on the *right* side of the mouth, convulsions, loss of speech, &c. He was so struck with the *flatness* of the convolutions of the brain on the right side as compared with those of the left, that he sliced off a portion, and immediately came to a larger coagulum of blood than he had ever seen without causing immediate death. This coagulum pressing from within outwards, was, he thinks, the undoubted cause of the appearance mentioned, (*Op. cit.*, p. 47.) Here is another proof of the symptoms of compression caused by actual mechanical pressure.

In those well-marked gun-shot injuries in military service, where the fracture, as of the parietal bones, and extravasation are the only lesions, with the insensibility from the extravasation coming on at a considerable interval after the infliction of the wound, the rule in surgery to remove the bone is absolute. So also thinks Dr. Cormack, (*Lond. and Edinb.*

*Month. Jour.*, Oct., 1843, p. 922.) When these cases are complicated with concussion and deep-seated extravasation, the diagnosis is difficult. When the brain remains depressed after the blood has been removed the symptoms are not mitigated.

[Dr. Henry J. Bigelow, of Boston, has published the particulars of a case of recovery after the passage of an iron bar through the head, which is probably unparalleled. A crowbar, three feet and a half long, and weighing above thirteen pounds, was driven through the brain of a man, and carried away a considerable portion of its substance, yet the patient recovered! We can only refer to this case, full details of which, with illustrations, may be found in the *American Journal of Medical Sciences*, July, 1850. G. C. B.]

*Ball-wounds perforating the Brain through and through, without causing immediate death.*—It is now deemed an established fact in pathological surgery, that an ounce ball or one even of larger dimensions may perforate through and through the anterior lobes of the brain transversely, as from temple to temple, and the patient yet retain all his faculties, digestion, sleep, reason, &c., for the space of 20 or even 30 days, until inflammation and suppuration ensue, and thus necessarily cause death. A case of this kind very recently occurred in America, at St. Louis, (State of Missouri,) in a gentleman thus wounded in a fracas. The particulars of another still more remarkable case are related by M. Blaqui re, (*Journ. des Connaiss.*, &c., Paris, 1844,) where a pistol ball, weighing the seventeenth part of a pound, passed through the anterior and lower part of the brain, of a child at Mexico, in 1842, aged only four years, each perforation being situated in the temple at the same locality, nearly, *i. e.*, about an inch and a half perpendicularly above the outer angle of the eye. Six days transpired of apparently almost *uninterrupted health*, when inflammation and suppuration supervened, and the child died, not however until the *twenty-ninth day!* The aperture at the entrance of the ball was found as usual in all bones, less than that at its exit. The cerebral substance between the track of the ball and the frontal bone, being a distance of 6 or 8 lines in extent, was found thickened. The substance of the brain above the track, and also the ventricles remained intact. The meninges were inflamed, and the perforation filled with pus.

*Foreign Bodies lodged in the Cranium.*—In alluding in the text to a case of Dr. Cheesman of New-York, in which a portion of a gun-barrel remained clasping for a long time the neck of the radius, (we think) we are reminded of a recent case related by Dr. O'Callaghan, (*Dublin Med. Press*, Feb. 1845, p. 82,) wherein, from the explosion of a fowling-piece, a severe wound was inflicted in the forehead immediately above the nose, in an officer of the Ceylon Rifle Brigade. Pus, bloody serum, and fragments of bone afterwards passed through the nostrils from the wound. The patient recovered and returned to duty, but in a few months was incommoded by a metallic substance protruding through the palate, with an offensive discharge, which he was entirely unconscious of, as the sense of smell had been entirely destroyed by the accident. The patient having afterwards died from intemperance, there was found, on examining the head, *the whole of the iron breech of a gun, with the screw attached, lodged in the forehead, weighing three ounces!*

*Abscess of the Liver from the Fracture of the Head.*—M. Blandin (*Annal. de Thérapeut.*, Paris, Mars, 1845,) considers inflammation of the veins of the diploe followed by suppuration, and which, it is said, was first noticed by Bruce (See Cormack's *Lond. and Edinb. Monthly Journal*, &c., June, 1845. p. 462) to be the source of abscess of the liver, so frequently observed after injuries of the head. This must be by means of phlebitis propagated to the liver; but why to the liver rather than elsewhere? And would not the same phlebitis, caused by injuries to the vessels in severe operations, as removal of the breast, testicle, &c., explain the sudden formation of purulent collections in the lungs, and other organs causing death?

Dr. Cormack (*ib.*, *loc. cit.*, p. 463) doubts, we perceive, the alleged frequency of abscesses of the liver, after injuries of the head, from inflammation of the venæ Santorini.

*Statistical Table of Wounds of the Head.*—MM. Lawrie and King (Cormack's *Monthly Journal*, &c., 1844) give the following results of their observations, upon a total of 234 cases in most of which the *trephine* was used:—

	No. of Cases.	Cures.	Deaths.	Incom- plete.
Concussion, (commotion,) . . .	110	94	11	5
Apparent concussion, but doubtful, . . .	8	—	8	
Sanguineous { without fracture, . . .	8	1	7	
extravasation, { with simple fracture, . . .	12	—	12	
{ with complicated do. . .	4	—	4	
Simple fracture { simple fracture, . . .	3	1	2	
of the { with depression, . . .	3	3	—	
Cranium, { with “ and operation, . . .	5	—	5	
{ compound fracture, . . .	10	6	4	
{ with depression, . . .	19	14	5	
Compound { with depression, or comminuted, } . . .	26	7	19	
Fracture { and the operation performed } . . .				
of the { in 24 hours after the accident, } . . .	14	3	11	
Cranium, { with depression, or comminuted, } . . .				
{ and the operation performed } . . .				
{ some days after the accident, } . . .				
Hernia cerebri, . . . . .	12	2	10	
	<hr/> 234	<hr/> 131	<hr/> 98	

Out of 77 cases of compound fracture, there were 29 cures and 48 deaths; 26 of these 77 cases were not trephined, and of them 18 were cured and 8 died; 51 of the 77 cases were trephined, and of them 11 were cured and 40 died. T]

[We copy from the *Brit. & For. Med. Chir. Rev.* Jan, 1850, the following statistics of Dr. Fritze of Nassau, founded upon the careful observation of 301 cases. They were originally published in Caspar's *Wochenschrift*, No. 30.



1. *Results according to the nature of the injury and mode of treatment.**a. Fissure or fracture without primary affection of brain.*

	Cases.	Rec.	Died.
No operation on the skull . . .	29	25	4
Removal of fragments . . .	8	7	1
Trephined . . .	2	2	0

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39 34 5
*b. Fissure or fracture with primary affection of brain.*

	Cases.	Rec.	Died.
No operation on the skull . . .	49	25	24
Removal of fragments . . .	4	3	1
Trephined . . .	20	6	14

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73 34 39
*c. Fissure or fracture with depression, without primary affection of brain*

	Cases.	Rec.	Died.
No operation on the skull . . .	22	21	1
Removal of fragments . . .	9	6	3
Trephined . . .	13	6	7

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44 33 11
*d. Fissure or fracture with depression and with primary affection of brain*

	Cases.	Rec.	Died.
No operation on the skull . . .	50	39	11
Removal of fragments . . .	26	14	12
Trephined . . .	69	35	34

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145 88 57

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301 189 112

Thus there were treated without operation . . .	150	110	40
“ “ by removal or elevation of fragments . . .	47	30	17
“ “ by the trephine . . .	104	49	55

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301 189 112

The trephine was employed prophylactically in . . .	16	15	1
“ therapeutically . . .	88	34	54
“ therapeutically in affection of brain without wounds	1	0	1
“ therapeutically in affection of brain with wounds	8	3	5

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113 52 61

Dr. Fritze compares these results of treatment with those derived from the treatment of the cases collected by Blasius and Leisnig.

From the comparison, it appears that a greater porportion of recoveries upon the whole occurred in his series of cases than in theirs ; but that the results in those cases where the trephine was resorted to, were much more favorable in their cases than in his. This he explains by the fact that all his fatal cases were the subjects of medico-legal investigation, the whole number that occurred being declared, which was probably not the case with theirs. An impartial and searching criticism of the 112 fatal cases has led the author to the conviction, that, in only 10 of the number, it was possible that trephining, or the earlier resort to this, might have preserved life. But, on the other hand, in 2 of the fatal cases, the operation seemed to be the cause of death : while in 5 of the recoveries it was probably unnecessarily resorted to. The following is the comparative view of the cases :

BLASIUS.						Cases.	Recoveries.	Per cent.
Without operation	.	.	.	.	.	242	83	34.3
Trephine	.	.	.	.	.	422	270	64
						664	353	53.2

LEISING.						Cases.	Recoveries.	Per cent.
Without operation	.	.	.	.	.	260	118	45.4
Trephine or removal of fragments	.	.	.	.	.	223	173	77.6
						483	291	60

FRITZE.						Cases.	Recoveries.	Per cent.
Total cases	.	.	.	.	.	301	189	62
Without operation	.	.	.	.	.	150	110	73.3
Trephine	.	.	.	.	.	104	49	47.1
Trephine and removal of fragments	.	.	.	.	.	151	79	52.3

## 2. Results according to age.

<i>Under 15 years of age.</i>						Cases.	Recoveries.	Died.	Per cent. of recoveries.
Without operation	.	.	.	.	.	37	30	7	81
Removal of fragments	.	.	.	.	.	14	13	1	93
Trephined	.	.	.	.	.	18	11	7	61
						69	54	15	
<i>Adults.</i>						Cases.	Recoveries.	Died.	Per cent. of rec.
Without operation	.	.	.	.	.	113	79	34	70
Removal of fragments	.	.	.	.	.	33	17	16	51
Trephined	.	.	.	.	.	86	38	48	44
						232	134	98	

Thus the injuries proved less dangerous to the young, and operative interference was seldomer required ; but when resorted to, were more favorable.

## 3. Results according to sex

						Cases.	Rec.	Died.	Per cent. of rec.
Men	.	.	.	.	.	264	174	100	63.5
Women	.	.	.	.	.	26	13	13	50

4. *Results according to the seat of injury.* A statistical examination of 291 of the cases, leads to the result, that the minimum of danger exists when the frontal region is the seat of injury; then the vertex; and next the occiput. The danger is the greater, the more extensive the injury is, and the more it traverses the lateral portions of the cranium, towards the basis.

5. *Results according to the cause of the injury.* From an analysis of 298 cases, in which the nature of the injury is stated, it results that it arose from a blunt instrument in 121, from a fall in 100, from a stone in 31, from a pointed instrument in 12, from a kick of a horse in 12, from a cutting instrument in 13, and from fire-arms in 9. The following is the proportion in which these different injuries were recovered from, in relation to operative interference:

					Treated without operation.	Treated by operation.
Cutting instruments	.	.	.	.	1.1	1
Pointed	"	.	.	.	1	2.3
Blunt	"	.	.	.	1.5	1
Stone	.	.	.	.	1.3	1
Falls	.	.	.	.	1.5	1
Kicks	.	.	.	.	1	1
Fire-arms	.	.	.	.	5	0

Statistics thus confirm what theory would teach us,—that the operation of the trephine is successful in proportion as the cause of injury more immediately limits its operation to the part of the skull that is struck, which is most so the case in wounds from pointed bodies, and least so in those from fire arms discharged close to the head.

In the *Lond. Med. Times and Gazette*, June, 1853, we find the following analysis of the cases of injuries of the head, examined after death, in St. George's Hospital, London, from January, 1841, to January, 1851, by Prescott Hewett, Assistant Surgeon to that Hospital. In this analysis he has included only fatal cases, in which the exact nature of the injury has been clearly ascertained.

*Scalp Wounds without Fracture of the Bones.*—In this decennium, 33 cases of scalp wounds without fracture of the bone were examined. In 10 of these cases death was produced by some other cause. In the remaining 23 cases, mischief of a serious nature soon followed the injury, and ultimately proved fatal. Diffused cellular inflammation occurred in 17 cases, and in 12 this was accompanied with erysipelas. In 4 cases there was diffuse inflammation of the neck, which spread down to the mediastina in 2, and caused oedema of the larynx in 2 cases. Hemorrhage in 2 cases followed sloughing caused by inflammation. In 9 out of 12 cases, where both brain and its membranes were healthy, death ensued from purulent infection. In 10 cases inflammation had existed about the membranes of the brain. In 8 supuration was found between the bone and the dura mater. The trephine had been applied in three cases. Most of the patients were persons of intemperate habits. Several had insisted upon leaving the hospital, but were re-admitted with swelling of the scalp and other signs of inflammation. Simple acupuncture, as recommended by Sir B. Brodie, relieves



the oedematous swelling not uncommonly following scalp wounds; but free incisions are required when suppuration ensues. Sloughing of the scalp is thus usually prevented. Separation of the dura mater from the bone may occur either as a primary or as a secondary effect. In the first case, the small vessels connecting the dura mater to the bone are ruptured by the blow; in the second, the osseous tissue inflames and suppurates. Generally speaking, the suppuration between the bone and dura mater is circumscribed, and the extent of the mischief on the inner side of the bone is exactly traced by that on the outer side; but should the suppuration occur in the parietal region, it may be much more diffuse. In this decennium there has been no single instance of the secondary puffy tumor of the scalp described by Pott. It has never fallen to the author's lot to witness a case in which the application of the trephine for the evacuation of pus within the cranium, as described by Pott had a successful issue. He has never known the trephine applied at St. George's Hospital with the view of evacuating matter situated either under the dura mater or in the brain. Matter may flow on the application of the trephine, from the cancellous diploe of the cranium. Purulent infection was observed in fourteen out of twenty-three fatal cases of scalp wound. This disease is found especially in injuries involving the osseous system; and M. Chassaignac believes that the removal by the trephine of the contused bone, before suppuration has taken place in its diploe, destroys the source whence the secondary mischief is for the most part derived; but such an explanation cannot be received as a valid one.

*Fractures of the Bones and Separation of the Sutures.*—In this decennium, 78 cases of fractures of the skull were admitted, 18 of which had received other severe injuries, of a nature likely to cause death; 56 were simple fractures; 22 were compound. Of the simple fractures, 19 were accompanied by wounds of the scalp not exposing the bone; extensive separation of the sutures co-existed in 14 cases. In 47 cases the injuries had been produced by the patients having fallen from various heights: in 10 the blow had been inflicted by some heavy instrument. In the 56 cases of simple fracture, there was only one single instance in which the injury was confined to the spot upon which the blow had been struck. Fractures of the base of the skull seldom exist alone; in a large majority of cases the injury co-exists with fractures radiating from the point where the blow was struck. In 68 cases of fracture of the base, six only were confined to this region; and it was only in two cases that no trace of fracture could be detected at the seat of the blow. In six cases of simple fracture, the injury was accompanied by depression, which was in all very slight. In 10 cases of compound fracture, there was also depression of the fragments, considerable in nine. Fractures of the skull, with depression of the inner table alone, occur but rarely. The author divides the skull into three zones, to each of which injuries are often confined, fractures of the middle zone being the most common. Fractures involving the orbital plates of the frontal bone are oftentimes accompanied with effusion of blood in the orbit. Bleeding from the ear is of not unfrequent occurrence in severe injuries to the head, indicating fracture through the petrous portion of the temporal bone, one of the surest is the copious discharge

of a watery fluid which may or may not be preceded by bleeding. The author believes the fluid to come from the sub-arachnoid space. That such is sometimes the case has been established by M. Robert, in a valuable paper in the *Mémoires de la Société de Chirurgie de Paris*, vol. I. The discharge occurred in old as well as in young subjects. M. Chassaignac has endeavored to prove that this fluid owes its origin to the filtering of the colorless part of the blood, and other surgeons have held that it comes from the cavity of the arachnoid. Such cases, however, if they do occur, must be rare. The author does not believe that the source of the watery fluid in all cases is the sub-arachnoid space, but in most cases, and especially those where it is clear and abundant from the commencement; and he refers to Mr. Hilton's lectures in proof of this statement. Extensive separation of the sutures co-existed with the fractures in 14 cases; separation of the coronal suture occurred in seven cases, and of the lambdoidal in three cases; of the sagittal suture in four cases. In one case, and in one only, there was separation of a suture without a fracture; it occurred in the posterior part of the squamoparietal suture.

Dr. Lente published in the *New-York Journal of Medicine*, January, 1852, a statistical account of the Fractures of the Skull, treated in the New-York Hospital, during the twelve years elapsing between the first of January 1839, and the first of April, 1851. The total number was 128, and the injuries were nearly all of an extreme character, depression, laceration of the membranes or of the substance of the brain complicating the fracture. In 45 of these cases, the operation of trephining was resorted to, and of these 11, or about one fourth recovered. It was performed *prophylactically* in 10, of which 3 were cured; *therapeutically* in 32, of which 8 were cured. Dr. Lente alludes to an interesting inquiry which was raised in a recent criminal trial in this city, viz. whether it is possible for an ordinary blow upon the head, producing fracture of the skull, to cause immediate death, and after an examination of the facts he comes to the conclusion that it is exceedingly improbable if not impossible, as was decided in the trial to which we have referred. G. C. B.]

[DEPRESSION OF THE SKULL RELIEVED BY A NOVEL MODE OF CUPPING.  
BY S. NICOLLS, M. D., *Surgeon to the Langford Union Infirmary.*  
(*Dublin Medical Press*, Sept. 1853.)

Some time ago a child, æt. two years, was brought to Dr. Nicolls, suffering from depression of the skull, consequent upon a fall from a table. The symptoms of the compression of the brain were urgent, and of some hours' continuance. On examining the head he found a deep narrow depression, about three inches in length, extending from the lateral part of the occipital along the parietal bone, but without any wound in the integuments. It occurred to him to try to elevate the depressed bone by the application of a cupping-glass, and with this end in view he tried several glasses of various sizes, but owing to the form of the parts he could not fix any of them. At last it occurred to him to surround the depressed parts with an embankment of common glazier's putty, and to apply the glass upon this, when he at once succeeded, both

in fixing the glass and in raising the depressed bone. The symptoms of compression passed off shortly afterwards, and the child recovered, without any ill consequence from the accident. G. C. B.]

## ARTICLE. II.—THE FACE.

I have mentioned, while treating excision of the nerves and exsection of the jaws, the cases in which trephining would be advantageous upon the face. I shall again return to this operation, in treating of diseases of the maxillary sinus, and exostoses of the visage. It is therefore, unnecessary to speak of it at present.

## CHAPTER II.

### THE CHEST.

After the cranium, the thorax is the part of the body, upon which the trephine has been most frequently applied.

## ARTICLE I.—STERNUM.

It was by means of the trephine,\* that Galen removed a carious sternum from a young man, who was wounded while exercising in a wrestling match, and in whom he was obliged to penetrate down to the pericardium, which itself was altered upon its anterior surface.

### § I.—Indications.

Avenzoar, according to Freind, recommends the employment of the trephine not only for abscesses of the mediastinum, but also for those of the pericardium. V. D. Wiell performed this operation successfully, for a large purulent collection. Colombo, Salius Diversus, and Juncker formally advise it; and Pauli and Solingen mention that Purmann succeeded with it in two different cases. J. L. Petit adopted their counsel, and the examples of this operation are now without number. A physician of Altorf, (Franck, *Méd. Prat.*, t. V., p. 138,) had recourse to it with success for a substernal abscess; as Ravaton, (*Plaies d'Armes-à-feu*, p. 249, 337,) also had in a similar case, and afterwards in another, to remove some wadding, blood and a ball. Storck, (Monro, *Essai sur l'Hyd.*, § 142, p. 306,) was enabled by this means to remove six pounds of blood and sanguinolent matter from the thorax. According to Sprengel, Boetcher recommends that it should be employed in fractures of the sternum, in order to make a passage to allow of our raising up the

[\* Unless the *trepan* is specifically alluded to by our author, as meaning to express an instrument somewhat different from the *trephine*, (see his remarks above,) the word now universally employed, we generally adopt the latter as the proper translation for his word *trépan*. T.]



depressed fragments. As an evidence of its advantages in such cases, De Lamartinière, (*Mém. de l'Acad. de Chir.*, t. IV.,) mentions that a soldier, wounded at the siege of Philipsburg in 1734, recovered perfectly after this surgeon had removed from him four large plates of bone which comprehended the entire thickness of the sternum. Mesnier, of Angoulême, was no less fortunate in a young man who had had this bone fractured transversely. Almost the whole of the caries was removed by means of a very large crown, while the inequalities of the opening were destroyed with the lenticular knife.

Alary imitated the example of V. D. Wiell, upon a coachman of the king's stables, who had been a long time affected with an internal abscess which had opened upon the neck in the supra-sternal depression. Sédiller of Laval, treated in the same way, a girl of twenty-two years of age, who, in consequence of an abscess caused by a blow upon the front part of the chest, carried a fistulous ulcer through which the mediastinum could be reached without difficulty. The carious sternum concealed a purulent collection, and the patient recovered in two months. An adult patient in whom an internal abscess had opened outwardly between the two first bones of the sternum, was received into the Hospital of Rouen in the year 1754. Lecat enlarged the opening of the integuments, rasped the contour of the bone, which had become altered by caries, and a few days after applied the crown of a trephine; which enabled him to introduce into the cavity the substances suitable for cleansing its walls. Ferrand, of Narbonne, had no apprehension, in a similar affection, though much more complicated, of removing a great portion of the same bone by means of the trephine, and several of the cartilages of the ribs, with the aid of a small saw, in a patient who ultimately recovered. Finally Auran had the same good fortune in treating a simple caries of the sternum. It is however certain, that in this last case the actual cautery was several times substituted with advantage for the trephine. The fact related by Aymar, of Grenoble, is a conclusive proof of it [this use of the cautery.] But Marchettis has made the remark, founded on his own personal experience, that in these cases, the cautery, by heating the neighboring parts, may become extremely dangerous, and that it is not unfrequently incapable of causing the separation of the necrosed bone. In support of his assertion, I could, if it were necessary, adduce what I have seen in one of the hospitals of Paris. The cautery was applied; the necrosis did not exfoliate, and the patient succumbed to the progress of the disease. We may therefore conclude with De Lamartinière, that the trephine is often a precious resource in necrosis of the sternum, whether this necrosis may or may not be caused by an external lesion, or whether it may conceal a purulent collection, or may exist alone.

M. Clot, (*Compte-rendu de l'Ecole du Abouzabel*, 1832,) who, in 1832 gives only two examples of it, states in 1835 (*Journ. Hebdomadaire*, 1835, t. II., p. 297,) that he had succeeded eight times in this manner in Egypt. But at the present day trephining of the sternum, like that of the other bones, is almost always associated in practice with exsection. (See *Exsection of the Sternum*, supra.)

[Dr. Hopton, of North Carolina, has reported in the *American Jour-*

*nal of the Medical Sciences*, 1829, vol. V. p. 545, a case in which he applied the trephine for the removal of a portion of a carious sternum.  
G. C. B.]

## § II.

*The Operative Process*, moreover, is subjected to the same rules as for perforation of the cranium, whether we resort to the crown, perforating trepan, Hey's saw, the rasp, &c.; except that the density of the bone being less, it is infinitely more easy to penetrate into the chest than into the head. The mammary artery could not be wounded unless the disease should oblige us to carry the instrument beyond the borders of the sternum. In his first case, De Lamartinière found it (the artery) so completely isolated that he deemed it proper to protect it with lint for several weeks. In another case the hemorrhage it occasioned was arrested by simple styptics. I shall not speak here of the proposition made by some persons, to employ the trephine in order to arrive at the envelope (pericardium) of the heart in cases of pericarditis, nor of that which recommends its use in order to reach the arteria innominata, in order to apply a ligature upon it;—because I have elsewhere spoken of the value to be attached to these suggestions.

### ARTICLE II.—TREPHINING THE RIBS.

We have seen above that the ancients sometimes had recourse to the trephine to open into the chest in cases of empyema, and that at the time of Hippocrates, some practitioners preferred piercing in this manner a rib, than making an incision into the soft parts. Though surgery at the present day possesses more simple processes for the operation of empyema, it nevertheless allows trephining of the ribs to be useful in certain cases of necrosis, or where foreign substances are implanted into the body of the bone itself. If, for example, the point of an instrument, knife, sword or bayonet, had broken in a rib in such manner as not to allow of its extraction by the forceps, the crown of the trephine could remove the bone and the foreign body at the same moment. In a case of necrosis, a crown of the trephine behind and another in front would enable us to extract the mortified fragment. If the sequestrum were invaginated in a costal sheath of new formation, [see our notes *supra*, on the Formation of Bones, Sequestra, &c. T.] the trephine would then still be indicated.

It is nevertheless true that in all these cases the sector of the ribs, the osteotome of Heine, and the different kinds of rowel saws which I have spoken of under the head of exsection, attain our object much better, so that trephining of the ribs at the present day is, or ought to be, almost entirely laid aside.

To perform it, it would be necessary, should the skin have become adherent and degenerated, and that an osteoform sheath existed there of great volume, to lay bare the whole diseased region by means of an extensive elliptical incision. Upon the supposition that the integuments might be separated, I should, in place of an incision parallel to the rib, prefer a T incision with its stem below, or an incision in form of an arc,

with its convexity also directed downwards. The simple incision scarcely ever allows of our isolating the diseased parts properly. By means of the T incision, we are enabled to turn over in front and behind, a triangular flap, which gives great facility for the employment of the other instruments. The arched incision offers still greater advantages; for by enabling us to raise up the tissues in the form of a half-moon, it afterwards puts it in our power to allow the flap to fall of itself over the wound.

The soft parts being thoroughly detached and raised up, the surgeon applies a first crown of the trephine in front, if he is about to place on several of them; or upon the diseased region, or the fistulous aperture of the cavity to be opened, if only one is required. The perforations having been made, the section of the hard parts is completed by means of Liston's scissors, or any other sector, after which we have recourse to the forceps to extract the portion to be removed. The vessels to be avoided, and the attentions required for the dressing, are in every respect the same as those I have mentioned under the head of *Exsection of the Ribs*, [supra.]

### ARTICLE III.—TREPHINING THE SPINE.

The spinal column forming as it does a long canal, enclosing a cord of the highest importance, cannot be affected with caries, necrosis or fracture without exposing to serious dangers. It were to be wished, therefore, that we might trephine or excise it like the cranium, sternum or ribs. It is an operation which Vigaroux (Hevin, *Cours de Pathol. et de Thér. Chir.*, t. II., p. 207) had already proposed in the last century, and one which some surgeons, in fact, appear to have since performed. The first attempt of the kind is attributed to Cline, and the second to Tyrell. A man who fractured the vertebral column was paralysed by the same blow. Supposing that the compression of the spinal marrow depended upon effused blood or some fragments of depressed bone, M. Tyrell (*Bull. de Fér.*, t. IX., p. 173) laid bare the dorsal region of the spine at its lower portion, and came down upon the eleventh dorsal vertebra. Having directed the trephine upon this point, he was enabled to disengage the osseous fragments, and to raise them up. The patient was relieved at first, but he died on the fifteenth day.

This operation, which is to be assimilated to excision or exsection of the spine or of the vertebral lamellæ, and which was performed by A. Smith, with the assistance of M. Dudley, and which I have spoken of farther back, does not deserve, as I think, to be retained in practice. In admitting that perforation or excision on the posterior region of the spine might be positively indicated, I do not believe that the trephine would ever become indispensable. Pure and simple exsection, by means of one of the osteotomes above mentioned, would be manifestly preferable.



## CHAPTER III.

## BONES OF THE LIMBS.

There are scarcely any regions upon the limbs, to which the trephine was not formerly applied. At present, it is an operation more and more neglected, and one which the new saws will perhaps ultimately render completely useless.

## ARTICLE I.—LOWER LIMBS.

§ I.—*Bones of the Metatarsus and Metacarpus.*

The surgeon not having at command the articulated or rowel saw, or Liston's scissors, and being under the necessity of excising one of the bones of the metacarpus or metatarsus, might make use with advantage of a small crown of the trephine, which he would apply upon the continuity of the bone, after it had previously been denuded upon its dorsal surface. It is in this way M. Wardrop proceeded, a long time since, for the head of one of the bones of the metacarpus, and it is the course that might still be adopted for the anterior extremity of the first bone of the metatarsus.

§ II.—*Bones of the Tarsus.*

Certain circumscribed points of caries or necrosis existing upon the cuboid bone or os calcis, might equally be removed by the crown of a trephine, better than by any other mode. If the disease were deep, and the soft parts altered only by a simple fistula, then the operation would require a crucial incision on the dorsal region of the cuboid bone and the plantar region of the os calcis, which, with the other precautions indicated under the head of Exsections of these bones, (*supra*,) would complete the manual.

§ III.—*Bones of the Leg.*

Trephining has often been employed for the bones of the leg. It has been used upon the tibia and fibula, and on the malleoli and near the knee.

A. *Tibia*.—The tibia, more than any other part of the skeleton, is exposed to necrosis and caries. I have already described in what manner we operate upon it for those two maladies by means of exsection. I will add only a word on the employment of the trephine in such cases. Scultetus, (*Arsén. de Chir.*, Obs. 81,) who states that he trephined the external malleolus, on another occasion applied two or three crowns of the trephine, and was thereby enabled to remove almost the whole of a necrosed tibia. To Cullerier (Obs. communicated by the author to M. Champion) we are indebted for a similar fact. Sequestra, of four or five inches extent, have been laid bare in three cases by M. Champion, (communicated by the author, 1838,) by means of two or three crowns of the trephine. The division of the soft parts, and the denudation of

the hypertrophied bone, are performed in both cases after the same rules. If, after this stage of the operation, the trephine was to be applied in the manner of a saw or osteotome, we would first place one of its crowns upon the most depending fistula in the bone, then another on a line with the one (fistula) highest up. It might afterwards be advantageous to apply several of them in the interval between the two first, in order to isolate the sequestrum completely. In two patients of M. Jobert, (*Journ. Heod.*, 1836, p. 21,) who ultimately recovered, seven were required in one case and four in the other. We may, however, diminish the number of these crowns, by evulsing the bridge left between the first, either by means of the erected saw, directed from the exterior to the interior, or by an articulated saw passed through the osseous canal to the exterior, or by means of the concave rowel saws, the gouge, or the chisel.

In conclusion, if there were true necrosed sequestra, I do not think that the trephine would in any case here be preferable to the excision which I have described. Upon the supposition that there were only osseous fistulas in the tibia, kept up by a false mucous membrane or by caries, we could on the other hand, include the morbid track of the bone in the crown of the trephine, and remove it by a single stroke. A patient whom I saw and who was treated in this manner by M. Monod, did very well.

An abscess in the substance of the bone, or in the medullary canal, which has been several times seen by M. Brodie, (*Arch. Gén.*, 2e série, t. I., p. 101,) and which I myself have once met with in the first bone of the metatarsus, should equally be laid open by the trephine. Boyer, (*Journ. des Nouv. Découv.*, 1681, t. III., p. 504,) had already proved this in 1669. Muralt, (*Obs.*, etc., p. 144,) furnishes another example of it. We are indebted for a third to Meekren, (*Observ. Méd.-Chir.*, exp. 72, p. 341,) and J. L. Petit, appears to have often trephined the leg with success for abscesses of the tibia. Michel, (*Journ. de Méd.*, t. LIX., p. 135, 1783,) was not able to cure an ancient caries of the same bone until he had trephined it in several places down to its medullary canal. A purulent cavity, which Faure, (*Mém. de l'Acad. de Chir.*, t. V., p. 828, in 4to, obs. 7,) mistook for a spina ventosa, was laid bare by him by the same operation. To Gooch, (*Gaz. Salut.*, 1775, No. XXVIII., p. 3,) is attributed the idea of trephining the tibia for an extravasation of blood in the interior of the canal of this bone, and V. D. Wiell, (*Manget*, t. IV., 2e partie, chap. II., p. 432,) did or saw done the same thing to relieve a contusion in the leg.

"When," says Pouteau, (*Œuv. Posthumes*, t. II., p. 106,) "in consequence of contusion of the bones, there is concussion with effusion and serious accidents, the trephine is the only resource for giving exit to the cause of these difficulties. I have, on two occasions, made this application of the trephine with the most perfect success. In the first case, the anterior surface of the tibia was sufficiently compact, (*i. e.*, solid,) though swollen; *in the other I found it rotten*, though the integuments appeared sound. I removed this rotten portion, by means of the rasp, and desiccated the remainder with the actual cautery; but perceiving that the iron had not in any manner assuaged the pains, I applied on the day after a large crown of a trephine, and this operation immediately put an end to the sufferings, [of the patient.] In both cases the cure was soon accomplished."

Trephining of the internal malleolus, like that of the inner condyle of the tibia, is sufficiently explained by what I have said of exsection or excision of those osseous projections.

[The trephine is now not unfrequently employed to relieve the pain produced by abscesses in bone. The credit is universally given by British writers to Sir Benjamin Brodie for priority in this operation, but this distinguished surgeon was certainly anticipated by Mr. Hey of Leeds, as may easily be proved by referring to his *Practical Observations in Surgery*, 3d. Lond. Ed. 1814, pp. 26, 36. He there reports three cases in which he trephined the tibia in the years 1787, 1792, and 1804, his avowed object having been to substitute this proceeding for amputation. In the *Memoirs of Dr. Nathan Smith*, by his son Dr. Nathan R. Smith, now of Baltimore, published in 1831, p. 114, we find it stated that it was his general practice to perforate the bone, for the purpose of giving vent to the matter formed during the active stage of periostitis or of inflammation of the medullary membrane of the bone. The instrument which he recommends is "a small trephine, that cuts out a piece about the size of a ninepenny bit," but he remarks that he has often succeeded by making a number of perforations through the denuded portion of bone, with the perforator used in trepanning. In February, 1839, the *Archives Generales de Medicine* republished an article from the *American Journal of the Medical Sciences*, written by another son, Dr. Morven Smith, in which are detailed several cases in which his father had operated. Sir Benjamin's observations, according to his own admission, (*Lond. Med. Gazette*, Dec. 1845,) were first published in 1832, therefore his claims must yield both to those of Mr. Hey and Dr. Nathan Smith. Most if not all of the cases recorded of this operation, we believe, are those in which the tibia was the part involved. After Sir Benjamin Brodie, Mr. Liston and Messrs. Henry Lee and Prescott Hewett, of London, have most contributed to advance our knowledge on this subject. Although this circumscribed chronic abscess of bone is most frequently found in the tibia, it has been observed in the clavicle, lower jaw and femur. Cases of the latter, have been mentioned by Mr. Liston and Mr. Arnott, and we have in our possession a beautiful specimen of this disease in the external condyle of the femur, taken from a patient whose thigh we amputated some four years since. Prof. Parker informs me that a similar case has occurred in his practice. In the case first seen by Sir Benj. Brodie in 1824, the disease was seated in the lower end of the tibia, "the skin covering the swelling was thin, tense, and closely adherent to the periosteum, but the ankle joint admitted of every motion and was apparently sound." The pain was constant, occasionally excruciating, and the disease had lasted for twelve years. After amputation, a cavity was found in the centre of the bone as large as a chestnut, filled with dark-colored pus. In our own patient, the knee joint admitted of free motion without pain, but the pain in the vicinity of the joint had for a long time been most agonizing. Even had we been able to form a correct diagnosis, on account of the situation of the disease, and the irritable, exhausted state of the patient, we could not have done otherwise than resort to amputation. In some cases, it may be a matter of difficulty to distinguish between this affection and the softened encysted tubercle so well described by M. Nelaton in his



memoir published in 1837. Mr. Langston Parker, of Birmingham, has several times trephined the tibia to relieve the pain arising from an inflammation of the medullary substance of the bone. He was led to adopt this practice long since adopted, as we have seen, by Mr. Hey and Dr. Nathan Smith, from the well known circumstances that in some instances where the operation has been performed with the expectation of finding necrosed bone and none has been found, the patients, by the free discharge thus given to the congested state of the medullary canal, have been permanently cured. A brief analysis of Mr. Parker's valuable paper on this subject, we published in the October number of the *American Journal of the Medical Sciences*, 1853. Cases of a similar nature, in which this operation has been advantageously performed, have been reported by Mr. Henry Lee, of the Locke Hospital, London. Mr. Fergusson prefers the gouge to the trephine, as with this, the surgeon, at each step, may see what he is doing, and take any indications which may present themselves, while the layers are removed, as to the exact position of the abscess. With the trephine the abscess, which is often very small, may be missed altogether. G. C. B.]

B. *Fibula*.—We may apply the trephine upon the fibula, the same as upon the tibia, and with so much the more propriety, inasmuch as this bone acquires double and sometimes treble its natural size when it becomes the seat of an invaginated necrosis. We may also remove a portion of its continuity by means of the crown of a trephine as well as with the saw, when it becomes necessary to extirpate its lower or upper extremity or even its middle part; but it is certain that by using the modern saws, sectors and osteotomes, we no longer at the present time have occasion in such cases for the employment of the trephine. It would be only for certain cases of deep-seated and very circumscribed caries of the external malleolus, that we could still feel the want of it. Having, therefore, indicated the circumstances where the trephine should be preferred, in treating of exsection of the fibula, I will not recur to that subject on the present occasion.

#### § IV.

When a necrosis exists in the centre of the femur, and the fistulous openings of the new sheath are too contracted, or cannot be enlarged by the rowel saws, the trephine may then be of some utility. Here, also, I have only to recal the rules which I have laid down under the article on *Exsections*, in relation to what concerns the division of the soft parts. The semi-lunar flap being raised up, we place a crown of the trephine at an inch above or below one of the principal osseous fistulas, so as to penetrate into the sheath which contains the sequestrum or the pus. A man, aged 33 years, had suffered a long time in his femur; a crown of the trephine was applied by M. Lynn, (*Gaz. Méd.*, 1838, p. 778,) at four inches below the great trochanter; an exit being thus given to an abscess in the medullary canal, and to some splinters of bone besides, the patient recovered. If this does not suffice, we are to divide, as I have already said of the tibia, the intervening bridge of bone by means of the crested or chain-saw. Upon the supposition that the sequestrum was too long or too voluminous to allow of our extracting it

by the first opening, we must then recommence in the same manner on another point, and break it with the *osteotrite* of Dupuytren, or make use of the gouge and chisel to evulse the projections which are in the way.

The great trochanter and the external and internal condyle of the femur, should be trephined, as has been said in the chapter on *Exsections*, should there exist a simple point (noyau) of caries, accompanied with necrosis or tubercles, and that the articulation was unaffected and the disease had extended to much greater depth than width.

### § V.—*Pelvis.*

I have already said, under the article of *Exsections*, that the ilium has sometimes need of being perforated. Boucher, having laid bare the external iliac fossa, traversed the bone of the ilium by means of a crown of the trephine, and gave egress in this manner to the pus of an abscess which was situated in the interior of the pelvis. If a necrosed portion were confined between two plates of new osseous formation in this region, as in the patient of Léauté, and that we had ascertained its mobility by means of a probe, some crowns of the trephine might also assist in laying it bare. A semilunar flap, with its free border below, and raised up to the crest of the ilium, would enable us in both cases to come down to the bone. If, however, the disease in question were an internal abscess, or some carious points of bone, without hypertrophy or sequestrum, it would perhaps be better then to confine ourselves to a simple crural incision.

*Coccyx*.—Sprengle states, that in a case in which there was an abscess in the pelvic cavity, Bilguer perforated the coccyx, or point of the sacrum, with the crown of a trephine, and thus cured the disease. I cannot, however, perceive the utility of trephining the coccyx in such cases; for it is easy to conceive that the bistoury could have reached the collection fully as well as the crown of the trephine, by penetrating upon one of the sides of the point of the bone, from below upwards, from before backwards, and from without inwards.

## ARTICLE II.—UPPER LIMBS.

The different portions of the thoracic extremity are no less susceptible of the application of the trephine than the corresponding regions of the abdominal member.

### § I.—*Fore-arm.*

What I have elsewhere said of exsection of the radius and ulna, shows sufficiently what we may hope from the trephine when the bones of the fore-arm are diseased. The new instruments employed at the present time render it almost useless in this region. It would be moreover upon the postero-internal side of the ulna, or the postero-external side of the radius, and after having made the proper incisions in the soft parts, that we would apply this instrument, should we be resolved upon using it.

[With the exception of the cases of abscess in the olecranon, treated

by Mr. Curling at the London Hospital, we are aware of no instance in which the trephine has been applied in this region. Mr. C. has reported in the *London Medical Times and Gazette*, for March, 1854, p. 211, two very interesting cases, in which the affection above mentioned simulated disease of the elbow-joint. In one of these cases, a cavity was found in the interior of the ulna in which were lodged two detached pieces of necrosed bone. Immediate relief, however, did not follow the operation, the disease recurring, for a few days, with almost its former violence, yet this finally subsided and the patient preserved the perfect motions of the joint. In the second case, the application of the trephine was followed by immediate relief. G. C. B.]

## § II.—*Humerus*.

After the tibia, the humerus is perhaps of all the long bones the one that has been the oftenest trephined. Below the condyles, I would recommend the same as for the tibia, a semi-lunar and very long flap. This flap, by being detached from behind forwards, would incur the risk of dividing only a part of the fibres of the triceps, and could be crowded very far forwards with the biceps and vessels. If it were the upper fourth of the bone, the flap I speak of ought to have its free border facing downwards. As to what concerns, moreover, the placing and application of the crowns of the trephine, we should proceed as I have described for the tibia or the femur.

## § III.

The clavicle would not permit of the employment of the trephine unless it was enormously hypertrophied and enclosed a long sequestrum to be extracted; and even then the concave rowel, or the chain saw, or other species of osteotomes, would almost always deserve the preference to the trephine. In using the instrument, moreover, we should have nothing more to do after the flap had been cut than to raise it from below upwards, in order to lay bare the bone, after which it is to be applied as has been described above.

## § IV.—*The Scapula*.

It has oftener become necessary to trephine the scapula than the bones of the ilium. A soldier received a thrust through the shoulder from a foil; the wound remained fistulous; an ulcer formed in the infra-scapular fossa, and the pus made its escape therefrom but very imperfectly. Mareschal, who decided upon the step of placing the crown of a trephine upon the injured bone, cured his patient. In another case, where there was only a simple necrosis, Else of London also trephined the scapula, and was no less successful. A specimen deposited in the Anatomical Museum of Alfort, by Flandin, and which M. Cloquet states that he has seen; also two other similar specimens that M. Jobert professes to have examined in the same collection, would go to show that the scapula may be necrosed and imprisoned between the two plates of a scapula of new formation. [See notes supra on the Formation, &c., of Bones. T.] We



may conceive how the application of the trephine under such circumstances might become useful ; while we may at the same time comprehend that the operative process cannot be traced out in a book, and that it is left for each surgeon to devise his own, by adapting it to the particular case which he has under consideration.

I ought not, in terminating this article, to omit remarking that trephining of the bones of the limbs, like that of the bones of the chest, is in almost every case closely connected with what I have said of exsection or excision of the same parts. I will repeat that the employment of the trephine has lost much of its interest and importance in these regions, since the chain saw, that of Heine, and the rowel saws, now recognised in the domain of surgery, have given us the power of perforating and dividing the bones in the depth of the tissues with the same facility that the bistoury gives us in incising and dividing the soft parts.

Both for trephining and for exsection of the body of the bones in cases of chronic diseases, I have endeavored to generalize the semilunar form of the flap. The convexity of the free border of this flap, which is either slight or very marked, as the case may require, gives to the surgeon the extreme advantage of being enabled to lay bare the parts extensively by means of a single incision, and that of possessing afterwards every facility for contracting or closing the wound. It is a form which unites the advantages of the T incision, and that of the crucial and V to the simplicity of the straight incision. It is adapted also, as we have seen, to almost all the bones which are susceptible of exsection.

## SECTION TWELFTH.

### TUMORS.

*Tumors* form an extensive class of surgical maladies, even after having deducted from them, abscesses already treated of under the article on Elementary Incisions and Operations, [Vol. I.,] phlegmons and every kind of tumefaction, whether acute or chronic, which is undefined by any well-ascertained limits, and the principal medication of which consists of topical applications and internal treatment.

My design now is to speak only of tumors which are ordinarily treated by mechanical means or which are submitted to the action of instruments.

Considered in this point of view, tumors still occupy a large space in the departments of operative surgery. They are, moreover, too different in their nature, volume, causes and situation, to make it possible to treat of them at length in a general manner. Taken in their ensemble, they have been sometimes attacked with simple astringents or styptics, sometimes by compression or caustics, by strangulation, by ligature of the arteries which are distributed to them, or incision of the contour of their root, and sometimes by excision or extirpation ; others have been treated by acupuncture or the seton, vaccination, crushing, or irritating injections and scarifications. As none of these numerous general methods can be suitable for all kind of tumors, it would be useless in this place to give their rules in detail. Thus compression, which is use-

ful in some cases of erectile tumors, would manifestly be inapplicable in cases of lipoma or exostosis. Crushing, which sometimes succeeds with synovial, sanguineous and lymphatic tumors, cannot be applied with advantage to scirrhus, elephantiasis, &c. Cauterization, which is not without efficacy in some species, would aggravate the disease in many others. Of what service would be a ligature upon the artery in a deep-seated lupus? Who would think of treating encephaloid tumors and neuromas by irritating injections? It is then in speaking of the principal kinds of tumor in particular that I shall have to consider the value, either absolute or relative, of the operations which are employed for them. On the other hand the classification of these tumors is exceedingly difficult. If the character of some of them would serve as a point of departure, it is not so for an infinite number of the others. If we take for our guide their situation, whether in respect to the tissue or the region of the body, we shall experience the same embarrassment, inasmuch as there are those which are developed almost indiscriminately, in all the organic systems, as well as upon all the regions of the body and at every depth of the animal economy.

As it is indispensable, however, to assemble them together in certain groupes, I shall treat successively of tumors of the integuments, (*tégumentaires*,) those that are vascular, lymphatic, neuromatic, lypomatous, hematic, synovial, osseous, elephantine and cancerous.

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## CHAPTER I.

### TUMORS OF THE INTEGUMENTS.

Having already made some remarks on warts and corns, and certain other vegetations of the skin, under the chapter on Elementary Operations, I shall only have to speak here of horny productions, and certain fibrous vegetations of the tegumentary envelope.

#### ARTICLE I.—TEGUMENTARY TUMORS, PROPERLY SO CALLED.

It sometimes happens that the surface of the dermis becomes swollen and vegetates to such degree as to produce an actual tumor. So long as this tumor does not exceed certain dimensions, it belongs to the class of warts, and should be treated as has been already pointed out. If on the contrary it acquires a certain volume, that, for example, of a small nut, or of an ordinary nut, or larger still, it should be treated by one of the processes which I have just enumerated. In these cases the tumor presents several varieties. If it is diffused and imperfectly circumscribed, and that its limits do not yet appear to be determined, we must not attack it either by the seton, ligature or extirpation. Astringent and refrigerant topical applications, compression, or even cauterization, are manifestly the only suitable remedies.

When the tumor is clearly circumscribed or, as it were, pediculated,

these last-mentioned remedies should be rejected, and our choice must lie between the ligature, excision, and extirpation.

### § I.

The *ligature* does not merit the preference in any case; as, however, it answers the purpose when the pedicle of the tumor has but little volume, and that its root is in no respect degenerated, we may make use of it in timid subjects, or those who are badly constituted, and especially in such as dread above everything, the application of the bistoury. In such cases, then, we surround the pedicle with a ligature of silk or thread, and tighten it forcibly, and in such manner as to strangle completely the vessels and other living tissues of which it is composed. The more sudden and powerful the constriction in such cases, the less painful is the operation, and the more rapid and complete the successful issue.

### § II.

The *excision* of pediculated tumors of the skin, disembarasses the patient of them immediately, and leaves a wound which generally cicatrizes with promptitude. This operation being speedy, easy, without danger, attended with little pain, and certain, is to be preferred as a general rule to the ligature. Before having recourse to it, however, we must make ourselves assured that the root of the pedicle is wholly sound at the point where it is continuous with the rest of the dermis. Otherwise, in fact, we should remove only a part of the disease, and the tumor would soon reappear. This excision is performed almost indifferently with any kind of cutting instrument. The surgeon, holding the tumor with one hand by means of the forceps or erigne, or causing it to be held by an assistant, readily cuts through the pedicle with a single stroke by means of a good pair of scissors or an ordinary bistoury. If it is small, he immediately cauterizes the wound with nitrate of silver, and has afterwards no need of any other dressing. The cure is generally complete when the eschar detaches itself at the expiration of a few days. If the wound should be larger, we should treat it like any other simple wound, and the cicatrization would not be long delayed.

### § III.

Nothing, moreover, would prevent us in such cases from combining *excision* with the *ligature*. The thread being applied, the tumor could immediately be effectually excised outside of it, inasmuch as it would cause no additional pain, and the patient would in this manner be disembarassed of a mass, which, in putrifying, continues in some persons for about the space of a week, to be sufficiently offensive.

### § IV.

*Extirpation* of cutaneous tumors, nevertheless, is the only proper



operation, when the alteration comprises the whole thickness of the skin at the point which serves as its root. Then it becomes important also to remove a certain portion of the sound tissues with the degenerated mass. For that purpose we make on each side of it a curved incision, so as to circumscribe a very long ellipse, the centre of which corresponds with the apex of the tumor. As it is unnecessary to penetrate deeper than the integuments, we stop at the sub-cutaneous tissue, and the operation is generally as prompt as it is easy. The wound which results from it is then treated by strips of adhesive plaster or by the suture, if we wish to attempt immediate union. In the contrary case, we dress it flat by means of the perforated linen and a gâteau of lint.

### § V.

A *process* which has appeared to me convenient when approximation by the first intention is to be attempted, consists in first perforating a fold of the skin under the pedicle of the tumor, with a sufficient number of pins while the tumor is being held up. These pins being once adjusted in their place, prevent us in nowise from proceeding to the excision in the manner just mentioned. They also allow of every facility in closing the wound, since nothing more is required than to pass a noose of thread around them in order to complete in an instant the twisted suture.

In these cases, moreover, as in others, the adhesive straps, needles and points of suture should be promptly removed, and replaced by emollient cataplasms, should there supervene the least appearance of erysipelas, whether simple or phlegmonous; better is it in such cases to take fifteen days in cicatrizing a small wound, than to incur the danger of diffused phlegmon.

## ARTICLE II.—HORNY TUMORS.

Horny productions have frequently been observed in man, in whom they present a form and dimensions exceedingly variable. There is no region of the body which has not been the seat of them; and the same individual might have a very great number of them at the same time. They have been noticed, and I myself have seen them on the cranium, forehead and mastoid regions. They often exist upon the nose, face and chin, and sometimes upon the lips. They have been encountered upon the neck, especially at the nape, also on the chest, belly, and sacrum, and about the genital organs. The limbs themselves are not exempt from them; they have been observed upon the shoulder, arm, elbow, fore-arm, and different parts of the hand. A horny exerescence resembling the enormous beak of a parrot, was successfully removed by M. D. Lassere, (*Cas. de Chir., etc.*, p. 42, fig. 5,) from the hand of a man who was eighty years of age. The same productions are found also upon the breech, thighs, legs and feet. An old man who died of an enormous cancer of the stomach, at the Hospital of La Charité in 1837, had the integuments upon his limbs so completely covered with them, that it was impossible to count them. There had been admitted some time previous into my department, (of La Charité,) a young woman

who was precisely in the same condition, and I have collected two or three other analogous facts. In all these individuals the horny productions were exceedingly small; they resembled so many points, heads, nails, or pins implanted in the skin.

When these horny productions are multiplied in this manner, there is no mode of submitting them to the processes of operative surgery. In such cases, if anything is to be attempted for the relief of the patients, we have no other resource but topical applications and general treatment, external or internal. In the contrary case, that is to say, when there is but one only, or a small number of them, when they are so large or elongated as to occasion inconvenience, and to induce the patient to demand their removal, these horns are to be attacked by the same processes as tumors purely cutaneous. Nevertheless, it is rare that they allow of our depending upon the ligature or simple excision. Being almost always deeply implanted in the dermis, they necessitate too powerful tractions upon them to allow of our placing a constricting thread upon the sound tissues behind them, [*i. e.*, deeper or below, or under their root.] The scissors or the bistoury also [in excision, *vid.* a few lines above. T.] would then divide the skin flat-wise, and produce a larger and more irregular wound, and one, consequently, less favorable to cicatrization, than that by extirpation. I should add that, in the extirpation of horny tumors, we ought, more even than in that of cutaneous tumors properly so called, to enroach at least to the distance of some lines upon the sound tissues, in order to be assured with certainty against every fear of a return. Though these tumors do not extend deeper than the skin except in some cases, they should be operated upon in the same manner in whatever regions they may exist. It could only be upon the cranium or face from the superficial position of certain arteries, that any particular precautions would become necessary. If they should penetrate to the muscles or bones, as has been seen in the thigh, or down to the dura mater, the surgeon would reflect seriously upon them before proceeding to their extirpation. But it is not required that I should describe this operation in particular, for the different regions of the body. I shall, however, be enabled to say a word in relation to it, in speaking of the other operations which are performed on certain complex organs, and there may be found in the Thesis of M. Dauxais, (*Des Cornes*, in 4to, fig., Paris, 1820,) together with all the known examples of horny vegetations in man, a very just appreciation of the remedies which prudence authorizes us to employ in such cases.

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## CHAPTER II.

### VASCULAR FUNGOUS OR ERECTILE TUMORS.

A class of tumors which has excited much attention among the moderns, is that which comprehends *nævi materni*, spots, marks, birth-stains, aneurism by anastomosis, erectile productions, and fungous sanguineous

tumors. These different names being employed to designate the same kind of morbid growths, have been almost universally superseded to-day by the title of erectile tumors, as proposed by Dupuytren, although this phrase is itself fully as objectionable as the others, (*Leçons Orales*, t. IV.) We understand by this, tumors or patches either of a reddish or of a more or less deep brown color. These productions, being composed of a net-work of vessels irregularly interlaced and combined together, present some resemblance to the tissue of the corpora cavernosa. These erectile tumors, however, contain almost always a degenerate structure, which essentially distinguishes them from the natural erectile tissues, and which predisposes them to transformations of a bad character. Nor is it rare also to encounter in them cerebroid or melanotic matter, and to feel embarrassed when called upon to decide, if the case in question is in reality one of erectile tumor or encephaloidal fungus. It becomes requisite, therefore, to establish several varieties of erectile tumors.

#### ARTICLE I.—SPECIES.

##### § I.—*Arterial Funguses.*

The most common, namely, those which are observed more especially upon the surface of the skin, and which have been known for ages under the name of *stains*, *birth-marks*, and *nævi materni*, depend almost always upon an unnatural dilatation of the arterial capillaries. So also are they generally of a bright red tint, and liable at moments to color deeper and become swollen to greater or less extent. Though erectile tumors in which the arterial capillaries preponderate usually occupy the skin, they are however developed also in the interior of the limbs, and at the centre or surface of certain particular organs.

##### § II.—*Venous Funguses.*

These, which from the very beginning acquire a sufficiently large size, and present a violet, livid or brownish hue, are more especially formed of veins, and are more frequently encountered underneath the skin, and in the depths of the tissues and organs, than upon the surface of the body. Usually flabby and crimped they readily shrink under pressure or in certain positions of the patient. To make them tense and to increase their size, we have only to incline downwards the part on which they are situated, and to maintain them in regard to the heart, in a depending position.

##### § III.—*Mixed Funguses.*

Very frequently the arterial and venous capillaries so blend together, that it becomes impossible to avoid making a mixed species of such tumors, or to assign them to one of the preceding classes rather than to the other. In these the physical characters are necessarily a mixture of those which I have just described. It is thus that with fungous and livid protuberances upon them, there are noticed also patches of bright



red which are hard and more homogeneous, and that by means of pressure or a certain position, they are in part flattened without having their color entirely effaced.

#### § IV.—*Fungus Hematodes.*

So long as erectile tumors do not present other characters than those described, their diagnostic is sufficiently easy. But if they become blended with tissues of a new formation, or with a more deep-seated degenerescence of their own elementary structure, we then have tumors which in part resemble encephaloid or melanotic or certain fibro-vascular tumors, and especially those which English practitioners have described under the title of fungus hematodes.

#### ARTICLE II.—TREATMENT.

Erectile tumors are not always situated in the same anatomical tissues of the body. At the surface of the body nothing prevents our attacking them by an infinite variety of surgical processes. Here we may recur to topical applications, compression, strangulation, vaccination, the seton, caustics, scarifications, the ligature, extirpation, &c. Underneath the skin they present more difficulties; astringents, caustics, vaccination, scarifications and the ligature, can no longer be applied to them, or at least with great difficulty. Deeper still, that is to say, between the muscles or in the thickness of those tissues, compression itself, the seton, and injections, can afford scarcely any chance of success while incurring the risk at the same time of real dangers. Nothing then is left to have recourse to but extirpation, and some other processes of a very questionable efficacy. We arrive finally to those [erectile tumors] which are situated in the structure of the bones themselves, and which leave us no other choice but the removal of the limb or a ligature upon the principal arteries which are supplied to it.

These preliminary observations were necessary to enable the reader to understand what I am about to say of the boasted operations for erectile tumors. I should add before going any farther, that although there may be erectile tumors which might give rise to serious hemorrhages, as is seen in the case mentioned by Turner, (*Maladies de la Peau*, t. II., p. 242, trad. Franc.,) there are others, as those of infants, those that occupy the surface of the skin, or which exist from birth for example, which sometimes continue for a great number of years without increasing in extent, or giving rise to any inconvenience. I have seen some which have ultimately wasted away and disappeared spontaneously. M. Ouvrard (*Op. cit.*, p. 385) mentions one which became inflamed and was thus cured. It becomes important, therefore, before undertaking their treatment, to ascertain with certainty, if they have a tendency to increase in growth, or that they have become so prominent at the surface of the skin as to give the child annoyance.

#### § I.—*Topical Applications and Compression.*

A. *Topical Remedies.*—These local means made use of by M. Cham-

pion upon the strength of the advice of Abernethy, (*Surgical Works*, Vol. II., p. 322,) proved unsuccessful in a case where compression, if not a ligature upon the carotid, would have alone sufficed; and I have scarcely any more confidence in this means than I have in the application of the hand of a corpse (*la main d'un mort*), seriously recommended by Van Helmont, (*Tumulus Pestis*, etc.,) as a remedy against erectile tumors, or *nævi materni*.

B. *Compression*.—Practitioners also are far from being agreed upon the efficacy of compression in the treatment of erectile tumors. Though Pelletan, Boyer, Abernethy and Dupuytren have obtained some advantages from it, J. Bell, M. Brodie and most other practitioners regard it as useless or injurious. The case cited by Boyer, of a *nævus* in which the tenderness of the mother effected a perfect cure in her child by holding her finger during several months, 7 or 8 times a day, transversely under its nose, is an exception which cannot serve for the foundation of a precept. The case in which M. Roux believes he succeeded, was not in reality cured, if I may rely upon the testimony of some ocular witnesses. I have seen a case in every respect similar to that of M. Roux; the same sex and the same situation in the disease; I prescribed compression, and a pelote bandage was prepared, but both the infant and the nurse became tired of it; nothing therefore was accomplished and things remained unchanged, (Champion.) Randolph and M. Roux, however, cite some other examples sufficiently conclusive in favor of compression. According to M. Récamier (*Revue Méd.*, Mars, 1831, p. 349) it effected the cure of a *nævus* which had become cancerous, after two ablations and cauterization had failed. It is moreover evident that this remedy cannot be suitable to all kinds of erectile tumors nor to all the regions of the body; those of the external surface of the dermis alone allow of its employment. Every thing indicates that it would not succeed in *nævi materni* composed of the venous capillaries; nor upon the abdomen, cheeks, breast, shoulder or elsewhere where the cutaneous patch cannot have a solid point d'appui, can compression be relied upon but with very little confidence. Should it be made trial of under an opposite condition of things, it would be necessary to continue it for several months with a perseverance which is rarely met with, nor would it then succeed once in fifteen or twenty times. As to the rest, the mode of effecting it is by the ordinary compressive means, such as bandages, machines, collars, apparatus specially adapted to this object, &c. M. Champion has seen areolar or saccular sanguineous tumors under compression develop themselves to considerable extent below the skin, and acquire an elongated form and sometimes a very great size.

In conclusion, it is a method which cannot be proposed but where every other is impracticable, or in persons who cannot bear the mention of any operation which is really effectual.

## § II.—*Vaccination*.

A very mild remedy, but one which scarcely deserves any more confidence than compression, is vaccination. Many English surgeons, among them M. Hodgson, the same without doubt whom a certain journal designated under the name of Dr. Godgson, (*Clin. des Hôpitaux*, No. 97,

t. II., p. 388, 1815,) as also MM. Earle, Dowling [Downing?] and Cumin, (*The Lancet*, 1829, Vol. II., p. 237,) were the first to extol this process for such affections. It is a method which I have made trial of, and recommended to many patients. An examination of the facts published in foreign journals, and those to which I have myself been witness, authorizes me at the present time to say, that vaccination may cure certain erectile tumors upon the cutaneous surface, whether arterial or venous; and that it even succeeded in a child whom I saw with M. Rayet, and who had a tumor of a mixed character of the size of a pullet's egg occupying the lower lip and one of the cheeks. But it is easy to comprehend, that if the disease were situated underneath the integuments, vaccination could scarcely have any effect upon it. It is suitable, therefore, only to external tumors, and to those of the mucous membranes which can be attacked upon the surface. The operation, then, requires that we should make a great number of punctures, whether internal, or external, upon the entire surface of the tumor. It is important, moreover, that these punctures should not be over four or five lines apart. From the moment when the vaccine pustules begin to dry up, a considerable degree of tumefaction gradually takes place in the whole mass, which becomes heated and inflamed, and sometimes terminates ultimately in resolution. It would seem in such cases, that the vaccinal process induces throughout all the canals of the erectile tissue, an adhesive inflammation, which prevents the afflux of fluids to the parts from being maintained, and definitively transforms the whole into a kind of solid and permanent cicatrix.

It is nevertheless true that vaccination will almost always fail against erectile tumors, and so much the more so, as it has no effect, it is said, upon patients who have been previously vaccinated, (Parral, *Archiv. Gén. de Méd.*, 1834, t. VI., p. 207.)

In the treatment of *Erectile Tumors by inoculating them with Croton oil*, which we have alluded to under those tumors, Dr. Alexander Ure, (*London Med. Gaz.*, March 21, 1845,) states that he has succeeded in one instance where a tumor of this kind of the size of a currant was situated at the inner angle of the right upper eyelid in an infant aged  $3\frac{1}{2}$  months. The oil was introduced by several minute punctures on the point of a cataract needle—and repeated twice. The tumor inflamed and rapidly withered away. T.]

### § III.—Cauterization.

The necessity of destroying nævi, in consequence of their hemorrhage, or deformity, or the rapid progress which the disease sometimes makes, besides being susceptible of reproduction, and of becoming cancerous, for what reason is unknown, says J. Frank, (*Méd. Prat.*, trad. Franç., t. IV., p. 434, et suiv.,) in consequence of repeated cauterizations and irritations, nevertheless constantly brings back the mind of practitioners to the same means. The potential cautery, moreover, which answered in several cases cited by Turner, (*Malad. de la Peau*, trad. Franç., t. II., p. 242,) F. de Hilden, (46 obs., 5e centurie; trad. Franç., p. 91,) and Muys, (*Nouv. Obs. de Chir.*, déc. 3, Obs. 1re., p. 155, trad. Franç.,) has frequently been employed, moreover, to destroy what the bistoury had left.



Cauterization for erectile tumors, however, notwithstanding the recommendation of it which had been given by Callisen, (*Chirurgia Hodiern.*, etc., p. 204,) and the praises bestowed upon it also by M. Hodgson, M. Guthrie, (Tarral, *Op. cit.*, p. 98,) and M. Weller, had nevertheless been generally rejected from ordinary practice as a dangerous remedy. Boyer (*Malad. Chir.*, t. II., p. 395) charges it with causing excruciating (atroces) pains, and of exposing the tumor to a dangerous degeneration. According to M. Bégin, (*Dict. de Méd. et de Chir. Prat.*, t. VII., p. 446,) it can scarcely have other effect than to hasten the development or the transformation of the nævus into a cancerous affection. Wedelins (*Prix de l'Académie de Chirurgie*, t. V., p. 124, in 12mo) relates that a nævus which existed in a girl, degenerated in cancer through the employment of nitric acid. These objections, acknowledged by M. Mannoir, (*Mém. sur le Fongus Hém.*, etc., p. 87,) and re-stated by myself and others, have not prevented M. Wardrop (*Gaz. Méd.*, 1834, p. 711) from employing this practice, and from endeavoring again to demonstrate its advantages. Encouraged by the successes of this practitioner, MM. Lawrence, Higginbottom, Lee, Langstaff, and some others mentioned by M. Tarral, have also used caustic, and all agree in justifying its employment. Defrance (*Thèse No. 267*, Paris, 1835) reports an observation which proves that M. Roux, receding from his first opinion, has also since made trial of it. I have also used it in a considerable number of children, and it appears certain at the present day, that the fears of Boyer on the danger of caustics, in such cases, are not well founded.

Cauterization, nevertheless, is only suitable to those superficial tumors, which are rather extended upon the surface than in depth. A child five years of age had a superficial and arterial tumor in the right ham. Repeated applications of potash ultimately destroyed it in a number of points; but perceiving that the disease increased in the same proportion upon the other side, it was deemed advisable to suspend the treatment. This child, who was subjected at a later period to a serious operation, died in consequence of the reproduction of the tumor. Another child aged seven years, whom a student of medicine exhibited to me at the Hospital of La Charité, and whose right breech was covered with an erectile tumor as large as the spread-out hand, was also only partially cured by caustic potash, so that extirpation was resorted to, which ended in the death of the little patient at the expiration of a few days. A young man who had quitted the army, was admitted into my department, at the Hospital of La Charité, for the remains of an erectile tumor which appeared to have occupied an extent of from five to six inches of cutaneous tissue, between the ischium and fore-part of the right thigh. This man informed us, that while in his regiment he had been treated by caustic potash; but that new patches of tumors continued to be produced upon the outside of those which has been previously destroyed. Certain it is, that he now had remaining one from two to three inches long, and about an inch and a half wide, the surface of which was encrusted, and seemed to be the seat of the commencement of a cancerous transformation. A layer of zinc paste effected its separation; a regular cicatrix of good character was established underneath, and the cure finally accomplished.

The children whom I have treated with caustics, had erectile tumors

which were situated in the interval between the eye-brows, and at root of the nose in one, on the side of the nose in another; the ala of the nose in a third and fourth, and on the fore-part of the chest in a fifth. The largest was not over an inch and a half in extent, and the smallest was twice the dimensions of a small bean. In another child whom I saw with M. Rayer, and who had erectile tumors in the dorsal and sacral regions at the same time as upon the face, the potash also succeeded, though one of these tumors was several inches in breadth.

A. *Diffused Cicatrization.* This operative process comprises two modifications: in one I use a piece of potash, in the same way as nitrate of silver. Having previously moistened the surface to be cauterized, I seize the fragment of potash, either with a forceps or the fingers protected by linen or paper, or after having secured it in a sort of crayon, I rub it upon all the projecting points and anfractuosities of the patch or tumor, taking care, it is understood, not to permit any of it to run upon the sound skin.

No dressing is afterwards necessary. As soon as the incrustation which results from this has separated, that is to say, at the expiration of from four to six or ten days, the same process is repeated, and so on successively, until there no longer remains any vestige of the morbid tissue. If the cicatrix should not have at the same time been formed underneath it, the wound is to be thence dressed like any other simple wound until the desiccation is completed. In this way we cause scarcely any pain, and four to five or six cicatrizations frequently suffice. This is what I should be disposed to call cauterization *en nappe*, and is the only mode I have been in the use of since 1837.

[MM. Bonnet and Gensoul have lately proved that the chloride of zinc may cure the disease known as aneurism by anastomosis. A tumor, occupying the summit of the head, an inch in thickness, and of rounded surface, about half a foot in diameter (15 centimetres), consisted of an immense number of anastomosing arteries, pulsating with a loud *bruit de souffle*, and was nourished by seven large trunks coming from the frontal, the temporal, and the occipital region, each about the size of the brachial artery. Injection was inefficient and impossible; pressure, continued for a year, failed, and the surgeons were talking of tying the two carotid arteries. The cauterization by the paste of the chloride of zinc effected the separation of the tumour without any hemorrhage whatever, from each of the nutritious arteries. The result of the case, not yet complete, is to be communicated at a future meeting of the society.—*Med. Times and Gazette*, July 23, 1853, p. 98. G. C. B.]

B. *Scattered Cauterization.*—Others have adopted a different mode. Applying an indefinite number of grains of potash at certain distances from each other, either at the same time or successively, their object is to riddle the tumor, so to speak, with small cauteries. After the fall of the eschars, they allow each ulcer to suppurate, these, in cicatrizing, prevent any reproduction of the erectile tissue beneath them. The potash applied in this manner by M. Tarral upon a tumor of the size of an olive, by M. Langstaff on smaller marks, by M. Laugier, (Tarral, *Op. cit.*, p. 200–205,) on a uretro-vaginal tumor as large as a nut, by M. Higginbottom in many other cases, and by M. Allier, (*Journ. des. Conn. Méd.-Chir.*, 1838, p. 188,) above the clavicle in an infant aged eight

months, has always succeeded in the same way as with M. Wardrop. If any protuberances remain in the interspaces, they are to be treated in the same manner until they have all disappeared. This mode of cauterization is not only more painful but less convenient than the other. It does not succeed so well when the tumor is spread out and thin, but it merits the preference for tumors with thick and unequal elevations, inasmuch as cauterization *en nappe* can never be but extremely superficial.

C. *Other Caustics*.—Perhaps, also, it would be advisable in this case, to employ the *zinc paste*, or Vienna caustic, in preference to potash. But this is a question of practice upon which time and facts do not yet allow of our giving a definite opinion.

I. The fear which had so long restrained surgeons, in respect to the dangers imputed to caustics, having been once dissipated, they soon had recourse to trials with other species of cauterization. Thus MM. Graefe, (Tarral, *Op. cit.*, p. 211,) and Guthrie, we see attack and cure certain superficial erectile tumors by means of *nitrate of silver*. Cauterization with nitrate of silver, says M. Champion, was the only method that could be employed in a new-born infant, in whom the *nævus* occupied the left ala of the nose, with the corresponding part of the lip; no trace of the disease was left behind, while an operation would necessarily have produced one. I should think indeed that *nævi materni*, which were but little extended and superficial, would often yield to this means. I have employed it on two occasions, with entire success for erectile *nævi* on the visage, which were only two or three lines in diameter. A young girl of eleven years of age, who had an irregular, slightly granulated *nævus*, of five or six lines' extent, below the great angle of the left eye, was cured in this manner by five applications of the nitrate of silver. But this kind of cauterization would inevitably be attended with no success, in cases where the patches were somewhat large or of a certain thickness.

II. Going from this extreme to the other, in respect to caustics, Dupuytren and some other surgeons have not hesitated to apply the *hot iron* to erectile tumors.

Though it may not be certain that Morin and M. Maunoir, who quotes him, had recourse to this treatment at the very first, it is at least proved that M. Graefe has frequently made use of it, since 14 examples of it are related in one account alone of his clinique. In order to cure a *pulsating* tumor, of the size of a nut, situated on the external part of the dorsum of the tarsus, and caused by a punctured wound from a nail, M. Fleury (*Archiv. Gén. de Méd.*, Mai, 1839, p. 87) was obliged to cauterize the base of it with red-hot iron some time after he had freely incised it.

For my own part, I am satisfied that the actual cautery which has been employed by M. Ouvrard as an auxiliary to excision, (*Observ. de Méd. et de Chir.*, p. 37,) would answer as well as chemical caustics; that we might make trial of it, therefore, with very considerable prospect of success in all cases of superficial erectile tumors; and that it would have the advantage also of enabling us to destroy at once both patches and projections, which the potential cautery could only remove in succession. Nevertheless, it is still a remedy which is suited only to tumors



upon the surface of the body; and since it has the inconvenience of inspiring great terror in the patient, and is far from always proving successful, and since M. Graefe himself states that he has seen it fail in five instances, and inasmuch as we may moreover obtain almost the same results with potash, or the Vienna paste, I am induced to believe that it will not obtain an extensive adoption in practice.

III. I cannot state to what extent, *butler of antimony, nitric acid, sulphuric acid*, and the arsenical pastes might be employed in these cases; but there is every reason to believe, that we might obtain the same results from them as from potash.

IV. Nor would perforating the tumor with *one or many red-hot needles*, as recommended by M. Bushe, (*Warren on Tumors*, etc., p. 418,) or introducing into its interior, through a track previously made for it by a seton, or some other instrument, a probe heated in the same manner as some English surgeons, and M. Macilwaine, (*Méd-Chir. Trans.*, part 1st, p. 189,) among others, have done, ever become an effectual operation in such cases. [We think our author's judgment, for want of experience in the treatment with hot needles, is for once at fault, in the expression of the opinion just given by him. Experience, in this country, at least, has satisfactorily established the important fact, as we have shown in detail, in our notes in Vol. I. and Vol. II., *infra*, that the treatment by *red-hot needles*, as so successfully practised by Dr. Mott and others, is by far the most efficacious and radical cure which has ever been attempted for ordinary superficial *nævi*, or even for those of larger extent, which rise to the elevation of half an inch or more above the surface. T.]

#### § IV.—*Tatooing.*

A German surgeon, M. Pauli, (*Rév. Méd.*, 1836, p. 253; *Journ. de Siebold*, t. XV.) has recommended and employed a process, which, in a certain point of view, resembles vaccination. This method consists in a species of tatooing, with carbonate of lead. The object of the author is to change the red color of the erectile tissue, or *nævus maternus*, into a white spot. It is satisfactorily established, that by puncturing the skin with needles, which have been dipped in substances of different colors, we imprint upon it marks that are perfectly indelible; it is a fact, the truth of which the people of India, and French laborers and soldiers, furnish daily evidence; but nothing shows that the patient has been in any respect benefited by the operation, though even his red patch should be superseded by a white one, and every thing leads us to infer that the tatooing of M. Pauli, is incapable of changing the nature of erectile tumors.

#### § V.—*The Ligature.*

The different kinds of ligatures have been applied to erectile tumors in the same manner as to all other excrescences which grow upon the surface of the skin.

A. *The Simple Ligature.*—When the tumor is pediculated, we may effectually strangulate its root circularly by means of a circular ligature.

M. Walther, and M. Maunoir, and before them, A. Petit, (*Observ. Clin.*, p. 364,) have frequently succeeded in this manner. There is every reason to believe that the excreescences strangulated in this mode by Saviard, (*Nouv. Obs. Chir.*, p. 515—516, obs. 114,) in the daughter of a draper, and in his own niece, were also pediculated erectile tumors. They had, says Saviard, a large head and thin neck. This form is less rare than the statement of authors would lead us to conclude. A hatter of Paris had one of the size of an almond, in front of, and below the right ear, which held only by a small pedicle of two to three lines in diameter, and which it would have been easy to strangulate. I have seen a similar one on the neck of another patient, and near the pubis in a third. The only precaution to be taken in these cases, is to apply the thread solely upon the sound skin. We operate, moreover, precisely in the manner which has been described in speaking of tumors purely cutaneous. Erectile tumors, however, presenting themselves most frequently under the form of plates, are rarely susceptible of the application of the simple ligature.

B. *A ligature traversing the Tumor.*—In such cases another mode has been adopted. Bell (*Surgical Works*, Vol. I.—Tarral, *Op. cit.*, p. 13) was one of the first who asserted that we might then pass a double ligature through the middle of the tumor, in order afterwards to strangulate each one of its halves separately with the corresponding thread. This kind of ligature, which is extolled by M. Warren, (on Tumors, &c., p. 417,) who constricts each fourth of the tumor, and the credit of which is given by M. Hutchinson to Allisen, (Tarral, *Op. cit.*, p. 13, Callisen?) and which is no other than the ligature so frequently employed by the ancients, has found sufficiently numerous partisans in England, and even in France.

M. White has used it with advantage, and M. Lawrence was indebted to it for four successful results in 1827. M. Brodie (*Gaz. Méd.*, 1835, p. 778) and M. Barton (*The Lancet*, 1829, t. II., p. 559,) extol it as one of the best processes that can be employed. It appears, moreover, that it has never been entirely laid aside by the surgeons of the Hôtel Dieu of Lyon. M. Bajard, (Bouchacourt, *Rév. Méd.*, 1838, t. III., p. 223, 234,) as well as M. Bonnet, have obtained strikingly successful results from it, and M. Gensoul (Perrod, *Thèse* No. 109, Paris, 1829, p. 39) had also already, in 1829, frequently succeeded with this method. An erectile tumor which surrounded the anus, was cured by means of numerous ligatures, by M. B. Philips, (*Lond. Med. Gaz.*, Feb., 1839; *Arch. Gén. de Méd.*, Juin, 1839, p. 239.) Nevertheless, according to M. Turner, (*Arch. Gén. de Méd.*, 2e sér., t. VI., p. 13, 14,) it was attended with accidents sufficiently serious, and even convulsions, in the hands of MM. Lawrence and Averil. MM. Syme, Carlisle, and Guthrie, who claim the credit of the ligature for the hospital of Westminster, also declare that it is an excellent process. It is, besides, employed in several different modes: sometimes the ancient processes are followed; that is, the double ligature, passed behind the tumor, is immediately doubled again, while the erectile mass is drawn forwards as if to detach it from the body; a first half is then tied with one of the threads, in such manner as to strangulate it tightly, after which the same is done for the other half. As this belongs to a general method,

it possesses nothing special for erectile tumors. It appears that Physick (Warren, *Op. cit.*, p. 419) tied erectile tumors only in portions and successively, at certain intervals.

C. *Ligatures under Pins*.—Others, after the manner of M. Gensoul, (Perrod, *Thèse* No. 109, Paris, 1829 ;) Bouchacourt, (*Rév. Méd.*, 1838, t. III., p. 235,) perforate the base of the tumor with a long needle or with a pin; then pass a thread under the extremities of this pin, in order to strangulate the tissues behind, in the same way as I have described under varices. There are others, finally, who, like M. Brodie and M. Barton, (*Gaz. Méd. de Paris*, 1835, p. 778,) or M. Keate, employ, instead of one pin, two pins crossing each other as in the process of M. Davat, with the view of strangulating with more certainty all the tissues in which it is desirable to produce mortification by means of the thread passed underneath.

The same principle governs all the modifications of the ligature. Provided the needles or threads pass through the *sound* tissues, that the constricting ligature makes its pressure upon the undegenerated skin, that no portion of the erectile tissue escapes behind it, and that the strangulation is sufficiently complete to arrest all circulation in the parts, the operation will be well performed. So that the simple ligature, or single pin or two pins crosswise, are nothing more than varieties demanded by the form or extent of the tumor, or the particular fancy of the surgeon.

Whatever may be the mode employed, the ligature, in other respects sufficiently painful, is suitable only, or inapplicable except to tumors which are purely cutaneous, accurately circumscribed, and little extended in surface, and which project considerably from the skin. More efficacious than vaccination, compression, tattooing and mild, caustics, it is less convenient, more painful, and more restricted in its use, than cauterization with potash, the Vienna paste, or the hot iron.

#### § VI—*Prolonged Acupuncture.*

Since the attention of practitioners has been drawn to the treatment of erectile tumors, it has been proposed to apply to them most of the means which I have recommended against varices. The facts which authorized me to say, in 1830, that needles or other foreign bodies, left for some days through blood-vessels and aneurismal tumors, would effect their obliteration, have become the point of departure for many new processes. A certain number of pins or needles, passed from one side to the other, at proximate distances and in various directions through the tumor, where they may be allowed to remain from eight to fifteen days, have unquestionably effected the cure of certain *navi materni*. M. Monod and myself employed them, in 1834, on a child aged eight months, who had an erectile tumor of a mixed character and larger than the fist, situated upon the cheek and the parotid region. Fifteen long needles were first introduced and left there; at the expiration of some weeks, they were replaced by fifteen small setons, and the same process was several times repeated during the course of the year. The tumor, which up to that time had developed itself with so much rapidity, ceased at first to increase. Beginning to diminish soon after, it ultimately became



so reduced as to form only a nucleus or irregular patch in the thickness of the cheek. At the present time, (January, 1838,) the child remains perfectly cured. M. Lallemand, (*Arch. Gén. de Méd.*, 2e série, t. VIII., p. 17,) who, without doubt, was ignorant of my first experiments, has cured an erectile tumor upon the shoulder by means of *one hundred and twenty needles*. Forty at first, and then fourteen, passed in this manner through the tumor, also equally cured a patient spoken of by M. Niehet, (*Gaz. Méd.*, 1836, p. 459; *Rév. Méd.*, 1838, t. III., p. 237.) A large *erectile tumor* on the temple of an infant, treated by needles by M. Maelaehlan, (*Gaz. Méd.*, 1839, p. 362,) appears to have entirely disappeared. Nevertheless, a girl aged from ten to eleven years, whom I saw with M. Sanson, and who had a venous erectile tumor upon the eye-brow, derived but very little advantage from this operation, which also did not succeed any better in a child whom I saw with the same practitioner at M. Rayer's. M. Bouhacourt also (*Rév. Méd.*, 1838, t. III., p. 237,) speaks of two patients who had submitted to it without success, at Lyon, in 1837. It would be wrong, in fact, to exaggerate its efficacy. Incapable of effecting the cure, except by inflaming the canals or sinuses which compose the tumor, this method exacts a considerable number of needles, and that all the tracks traversed by these foreign bodies should afterwards become effectually obliterated. We may, therefore, conceive that, in a certain number of persons, fragments of the vascular tissue must escape in spite of all our efforts, and would thus continue to keep up the disease. Acupuncture, performed by this mode, would not probably be attended with success, except with tumors that were more projecting than extended, with large meshes and a tissue really fungoid. So also is it a method which is scarcely suitable to *birth-stains*, or to erectile tumors that are purely tegumentary. An infant of fifteen months, who had one of these tumors at the root of the nose, was only half cured by the passage, thrice repeated, of seven to eight needles. Caustic potash was employed by me, at a later period, to effect the cure. [It is gratifying to perceive that our author, so long since as this edition was published, (1839,) had formed a just appreciation of the general insufficiency, in *nævi*, of this favorite, original, and triumphant process of his for *varices*, by transfixing with needles. It will be seen, by our notes below, that the practice in *nævi* is at the present time still more generally discredited, and yet that it closely infringed upon, and approximated to, and doubtless actually led to the truly efficacious, *if not almost always radical cure*, of all *nævi* of every description, deep-seated or superficial, to wit, the application, *once or twice only* (see our Vol. I.) and for a few moments successively, of some half-a-dozen *red-hot needles*, instead of *a hundred or two hundred cold ones*, during the space of a year. T.]

#### § VII.—Setons.

The idea of passing a seton through erectile tumors, which is generally ascribed to M. Fawcington, (*The Lancet*, 1831, p. 162; Tarral, *Op. cit.*, p. 207,) is one which, if we are to believe M. Tarral, (*Arch. Gén. de Méd.*, 2e série, t. VI., p. 207,) MM. Lawrence, Macilwaine, and Langstaff, have frequently made use of (*Lond. Med. Rep.*, Nov. 1822)

with apparent success. The seton had been employed ten years before, by another English surgeon, (*Gaz. Méd. de Paris*, 1834,) for a tumor which was of the size of an egg. Mr. Lawrence, in a case under his care, perceiving that the seton caused scarcely any inflammation, withdrew it from the tumor after the expiration of a few days, in order to besmear it with nitrate of silver, and to re-introduce it into its primitive track. External cauterization, nevertheless, became necessary to complete the cure. In the patient of M. Macilwaine, the seton brought on a very violent inflammation, and a suppuration which continued for thirty months. M. Michel also states that he has used the seton upon one occasion; but every thing shows that his patient was affected with a fibrinous tumor at the knee, and not an erectile tumor. The few facts published on the employment of this resource, show that it never will, in reality, constitute the remedy to be depended upon for erectile tumors. The use hitherto made of it, only proves that these tumors may be transfixed by foreign bodies, with less danger than had at first been anticipated.

#### § VIII.—Numerous Setons.

Setons applied to the number of several, in the manner I have said with pins or needles, have been attached with some advantageous results in six of my patients. By means of a common and straight needle, if the case is one of a small external tumor, a spear-shaped needle curved at its point, for tumors of a certain diameter, an ordinary curved needle for sub-cutaneous tumors, or those which are found in any deep excavation, I introduce three, six, ten, fifteen or twenty threads; through the tumor in all directions, so as to perforate it at every point. I take care that each of the points of thread represents a large free noose, which is afterwards cut through in its middle. The two ends of each respective seton being tied into as many circles which may be made to turn easily in the tumor, the free portion of all those rings, fixed above by means of adhesive plaster, is detached from the latter, the day after, in order that the surgeon may act upon them with a movement backwards and forwards, and make each one of them glide through the portion of the tumor it has traversed. We repeat this each day until the whole of the sanguineous mass is actively inflamed which will happen about the end of the first or second week. I withdraw then all the threads, and the employment of topical applications at first emollient and then resolvent, will suffice to calm the inflammatory movement they have occasioned. When the tumor is no longer heated or painful, or that it ceases to diminish, we may, if there still remain in its interior any spongy portions, which do not appear to be obliterated, traverse it again in every possible direction with another series of setons.

It may be required thus to renew this application four or five times. Each seton having no other effect than to transform into compact tissue the track which it has passed through, we may readily conceive that it may become useful to insert an infinite number of them successively through certain erectile tumors, and that the success of the operation will not be complete, so long as the threads shall have suffered to escape the smallest lobule of the sanguineous production.

In conclusion, the treatment by numerous setons is not suitable to erectile tumors that are flat and superficial. Those which occupy the lips, interior of the mouth, and different regions of the face, and the subcutaneous tissue, will find in this resource a remedy truly efficacious, so long as they are made up only of vascular branches that are regular, or that are of a small volume. In the cases of tumors with larger canals, and those that are voluminous and deeply-situated, it is better to recur to other methods. In a young lady whom I saw with M. Marjolin, the tumor obliged me at a later period to have recourse to extirpation. Setons also are to be rejected where the tumors are already anfractuous, —vid. supra,) hard and painful, or where there is the least appearance of cancerous degenerescence.

### § IX.—Suture.

If in place of confining ourselves to the form of a seton, we should perhaps succeed better if we were to change the operation into a spiroidal suture, by means of long threads. Interlacing the tumor in all sorts of ways, this suture would combine the action of the seton to that of the ligature or strangulation, and would present thus greater chances of cure. It is a method in my opinion, which deserves a trial.

### § X.—Crushing.

The idea of breaking up erectile tumors, seems to belong to M. Marshall Hall, (*Lond. Med. Chir. Journ.*, Vol. VII., p. 577 ;) but it is M. Henning who first put it in practice. The case was one of a tumor of half an inch in diameter: the surgeon plunged into it at one of its borders a cataract needle, and thus traversed it in eight or ten different directions without withdrawing the needle or touching any other point of the skin. A slight compression prevented all hemorrhage, and no accident supervened.

The cure not having been effected until at the expiration of six months, creates in reality a doubt as to the efficacy of this remedy, though M. Hall asserts (*Farral, Op. Cit.*, p. 211,) that he has since effected several other cures from it. We could in fact comprehend that certain tumors thus broken up in their interior, might be resolved, and become absorbed, especially if compression and topical astringents were associated with the crushing; but it is extremely probable also, that others might resist this mode of treatment, be transformed into a sanguineous depot, or abscess, and give rise under its influence to some serious accidents.

For superficial tumors, then, crushing offers fewer chances of success than cauterization. For deep-seated tumors, it is not as good as numerous setons.

[In a late essay *De la rupture ou de l'encrasement sous-cutané des tumeurs en general, des tumeurs sanguines en particulier*, (*Jour. des Connais. Med. Chir.* Jan. 1844) M. Velpeau has drawn more particular attention to this proceeding.

The value of this principle of rupture is of course founded on the long-recognised and well-established pathological principle of the innocuousness and safety of wounds sheltered from contact with the air, and



its successes corroborate to the same degree the philosophy and truth of the sub-cutaneous section of tendons, muscles, bridles, &c. Bloody tumors (*des tumeurs sanguines*) are also instantaneously cured by M. Velpeau, by rupturing or crushing them, [i. e., without, of course, breaking the skin.—T.,] though they may be of the size of an *egg*, or of the wrist. No dressing is required. The steady downward and utmost pressure of the thumb on a prominent point of the tumor, is all generally that is required, the part affected being placed on a solid plane. If this pressure does not suffice, a plate of wood on the tumor, and a stroke of a mallet, &c. on this, will answer. If any bumps remain, these are also to be crushed. Bloody tumors in accidental cavities are more curable than those in natural ones. The cure requires (M. Velpeau thinks) that the contents of the tumor, thus dispersed in the cellular tissue, should be easy of assimilation. The synovial cyst, though the only one which for ages has been subjected to this treatment, is the least favorably disposed to it of all; for in these the walls of the cavity, unless *compression* is used subsequently, will not adhere, and thus the tumor will be reproduced. T.]

### § XI.—Injections.

If every erectile tumor consisted only of a cavernous mass, whose tissues freely communicated with each other, the idea of injecting a liquid into it, would be very natural, and might lead to a method as efficacious as it would be simple. We have seen, however, that the fact is not so, that sufficiently often these tumors are formed of large canals, [or large varicose arterial or venous dilatations. T.] and of grumous clots, and sinuses, or small vessels, altogether independent of each other in their calibres.

A. M. Lloyd.—Nevertheless, as the cavernous arrangement cannot be called in question in some of these tumors, the processes of injection ought not to be rejected without examination. M. Lloyd, (*Gaz. Méd.*, October, 1836,) who was the first to extol irritating injections, viz., in 1828, made use of a mixture of three to six drops of nitric acid, to a gros of water. By several times injecting this liquid into the tissue of the tumor, by means of an Anel's syringe, while compression was established around, in order to protect the sound parts, he completely cured his patient. M. Bell had equally succeeded, in following the same method; but M. Toogood, and M. Ward, in 1834, wrote to M. Farral, that they had made trial of M. Lloyd's injections without success.

[Mr. R. S. Davis (*Lond. Lancet*, July, 1845, p. 81,) affirms that he has treated several *nævi-materni* with the happiest success in the space of a few days, by merely injecting into them, through several small punctures, and by means of Anel's syringe, a saturated solution of alum, until the tissues are well distended. He trusts the practice, which he says originated with the late Mr. Tyrrell, will come into favor with the profession. T.]

B. The *Author*.—For myself I should not hesitate in injecting sub-cutaneous tumors, by employing a larger sized syringe, and tincture of iodine, in place of solution of nitric acid. If, as many facts induce me to believe, this tincture infiltrated through the tissues does not mortify

them like wine, it would I am sure cause the disappearance of the cavernous or areolar form of a good number of these erectile tumors. Having made a puncture with a cataract needle on one of the points of the circumference of the tumor, I would introduce therein the beak of the syringe, and then throw up the injection with a certain degree of force. Repeating this injection as often as would be required for the liquid to reach all these canals, I would obtain either an adhesive inflammation or suppuration which would offer a like number of chances of success. There would in fact be no reason why, if the tumor were voluminous and deep-seated, we should not make use of the trochar, and proceed as in the operation for hydrocele.

[We have already alluded to the recently proposed plan of treating erectile tumors &c., by injections of the perchloride, and lactate of iron. The following is one of the most remarkable of the kind, that we have found recorded.

CASE OF ERECTILE TUMOR OF THE ORBIT. BY DR. DANIEL BRAINARD,  
*Professor of Surgery in Rush Medical College, Chicago, Illinois.*

On August 1st, 1851, the patient, a farmer, first consulted Dr. Brainard for a tumor of the left orbit, possessing all the aneurismal characteristics. He supposed it to arise from a severe kick from a horse, fracturing the lower jaw. The tying of the common carotid was proposed, but he declined, until the 11th of November, when it was performed in the usual manner. Bags of pounded ice and salt applied to the orbit relieved the acute sensibility of the part. The tumor gradually diminished in size, though a thrill could still be felt.

On the 11th November, 1852, just one year from the first operation, he returned to me. At this time the entire orbit was filled, the lower lid was concealed by the fungous projection, the eye pressed outwards and downwards, and at the root of the nose and inner part of the superciliary ridge there was an elastic swelling, which had caused the absorption of the bone. It was at that point that the pulsations were strongest and the thrill most distinct. The small vessels of the forehead and side of the nose were greatly enlarged, pulsated strongly, and the latter gave the peculiar thrill of the disease very sensibly. His general health was much impaired, and he had been able to come to the city by railroad only with great difficulty.

The question of the proper treatment to be employed in a case of erectile tumor of the orbit, when the ligature of one carotid has failed to effect a cure, is one of some difficulty. The attention is naturally turned to the other carotid; but even if the ligature of that were likely to succeed, the risk in this case was too great, since it was found that compression of it for a few seconds rendered him perfectly insensible. None of the means resorted to for the purpose of obliterating this vascular tissue had ever been tried on deeply-seated tumours, like those of the orbit. On carefully reviewing them all, it was determined to try puncture with hot needles. This was done first on Nov. 13th, 1852; the needle used was of the size of a common knitting-needle, sharpened to a triangular point and set in a handle of bone. After being heated in the flame of an alcohol lamp, it was plunged into the tumor about an inch

from the root of the nose, in the course of the superciliary ridge, and carried downward and backward to a depth of over three inches; on withdrawing it, some bleeding followed, which was readily stopped by slight pressure. For two days there was little pain or swelling; but on the third day the inflammation was acute, the swelling extending over the face, and presenting an erysipelatous appearance. On the fifth day this began to decline, and in a week was nearly gone. While the inflammation was at its height the tumor was more firm and the thrill less distinct, but as it subsided the elasticity and pulsation rapidly returned.

Nov. 25th. I repeated the operation, making the puncture half an inch nearer the nose, and carrying it to a depth of only one inch. The effects corresponded with those before described, but were a little less violent. On the third day the sound was diminished, and the firmness of the tumor very sensibly increased. On a careful examination it was found that the morbid tissue extended over the bridge of the nose and down to the inner canthus of the right eye, where a thrill could be distinctly felt.

Dec. 2nd. A puncture was made on the left side of the bridge of the nose, the needle being carried obliquely upward and to the left side. The inflammation resulting from this puncture was acute, and a superficial suppuration occurred about it. The thrill upon the right side of the nose quite disappeared.

The effect of these three punctures was to limit the spread of the tissue upon the forehead and nose; but the inflammation, although acute and extensive, was superficial, and the mass of the disease at the centre was still unaffected. It was evident that the needles cooled in passing through the tissues, so as not to cauterize much below the surface.

It was therefore determined to change the treatment, and inject a fluid into the centre of the tumor capable of effecting its obliteration. For this purpose a solution of the lactate of iron, of the strength of eight grains to one fluid drachm of distilled water, filtered through paper, was preferred. The reasons for believing in the safety and efficiency of this remedy will be given below.

14th. I punctured the tumor at its most prominent part with the infiltrating canula, carrying it to the depth of about an inch; on withdrawing the stilet arterial blood followed. A fluid drachm of the above-named solution was immediately thrown in with a small syringe, constructed for the purpose, and the canula withdrawn. The immediate effect was an intense pain in the left temporal region and a flushing of the face, which latter only lasted a few seconds. A chill followed, accompanied with nausea and vomiting. Reaction took place in an hour, but the vomiting continued, and for twenty-four hours all drinks were ejected; pulse 63.

15th. Vomiting still continues; pain less; upper lid much swollen; pulse 65.

16th. Vomiting less; no pain; has slept well; pulse 60; swelling increased, and so tender as not to bear the slightest touch.

23rd. For the last six days the vomiting has gradually diminished; the pulse is natural; the tumor is less tender, firm, and the pulsation perceived only at the external angle; frequent lancinating pain is felt in the orbit.



During the whole of this treatment, both of punctures and infiltration, the head has been kept enveloped in bladders filled with a freezing mixture of pounded ice and salt, which was very grateful to the patient. He now began to complain of its being too cold. The heat in the head was reduced to a natural standard, and from the time of the infiltration neither thrill nor sound has been perceived. The veins of the face were much diminished in size, and the pulsation of the arteries reduced to its natural state. A slight pulsation was still perceptible at the external angle of the eye, for which a puncture was made at that point with a hot needle, on January 4th, 1853.

Jan. 10th. From the time of the last puncture no pulsation has been perceived, the swelling subsiding. At this time an opening was found to exist on the anterior surface of the globe of the eye, which still remains protruded between the lids. This was followed by severe inflammation of the globe, which lasted several days. The discharge from the opening was at first the humors of the eye, afterwards pus, but no blood.

Feb. 5th. Swelling gradually subsiding; tumor firm, no pulsation; but little pain. The patient slept for the first time for more than a year without some one to keep wet cloths upon the eye, dressed himself, and walked about the house; health good.

March 5th. Swelling entirely disappeared; the globe of the eye perfectly collapsed; lids closed.

June 6th. The patient has been pursuing his ordinary occupation for three months; his health appears perfectly restored. The left orbit seems entirely excavated and free from disease. G. C. B.]

## § XII.—Incisions.

Sanguineous tumors, however, which bleed upon the least handling, or from the slightest abrasion, have in some cases been attacked successfully by large incisions. The following is the plan which was adopted by an anonymous author, (*Gaz. Méd.*, 1833, p. 321,) who communicated his observations to one of the Journals of Berlin. A child had a large sized tumor upon the temple: the surgeon having slit up this tumor deeply throughout its length, emptied it by means of fine pieces of sponge of all the blood which could thereby be expelled from it; pieces of linen folded being then introduced into the wound, allowed of making compression over the whole of it, which ultimately resulted in a cure. The author regards this method as one that is very effective and of an easy employment, especially where the subjacent tissues render the compression supportable. M. Lallemand, (*Archives Générales de Médecine*, 2e série, t. VIII., p. 8, 14,) had imagined something similar in 1835. After having excised a slice of the tumor, or simply slit it up at various points, this practitioner united the wounds by means of the twisted suture, and was thus enabled to cure two of his patients.

The facts of this kind published up to the present time, prove that there has been too much apprehension of hemorrhage from the action of surgical instruments on erectile tumors, but they do not demonstrate that a simple incision suffices to cure this kind of disease. A sacculous

nævus (*Eph. Nat. Cur.*, Dec. 2 au 6, p. 688, Obs. 199; *Coll. Acad., partie Etrang.*, t. VII., p. 476) which was situated in the mouth, and which was laid open, gave rise to a fatal hemorrhage. We should succeed better, no doubt, by multiplying and crossing the incisions, so as to divide the tumor on a large number of points; but then the operation would be more serious than excision, properly so called, and we should rarely obtain other results than those we might reasonably hope for from multiplied setons or the suture. No one, moreover, would probably venture to attack in this manner voluminous erectile tumors, or those which exist at a certain depth in the natural cavities or in the body of the limbs.

### § XIII.—*Ligature of the Arteries.*

As erectile tumors result from vascular exuberance, it has suggested the idea that the remedy above all others for arresting their development and for destroying them, would be to obliterate the vessels which go to or come from them. From whence has arisen a method which comprehends many modifications. Some surgeons have limited themselves to deep incisions upon the sound tissues around the tumor; others isolate each artery in the neighborhood and immediately apply the ligature to it: there are others again who lay bare the principal arterial trunk of the region without troubling themselves with those of the tumor itself.

A. *Incisions around the Contour of the Tumor.*—In a patient affected with an erectile tumor upon the right fore-finger, and whom M. Hodgson had without any result subjected to a ligature upon the radial and ulnar arteries, M. Lawrence (*S. Cooper, Dict. de Chir.*, p. 170) incised the whole contour of the root of the finger, when the tumor disappeared. Physick (*Dorsey, Elements of Surgery*, Vol. II., p. 273) had successfully made trial of something analogous a long time before. If the tumor were too large, perhaps it would be advisable to imitate M. Gibson, (*Ibid.*, p. 272,) and to surround it only successively, that is to say, incise at first the third of its circumference, to do the same at the expiration of eight or ten days on another third, and so on till the operation was finished. Except, however, upon the fingers, and when the tumor is large and flattened, we cannot perceive the advantages of this method over extirpation properly so called, and every thing goes to show also that the ligature upon the neighboring arteries would attain the same result. If, however, we should decide upon doing it, it would be necessary to take care and direct the bistoury perpendicularly upon the sound skin, as in simple incisions, and not to fail in penetrating down to the aponeurosis; all the arteries should be tied successively as they are opened, and small *rouleaux* of lint afterwards placed in the wound to hold the lips apart. We thus perceive that it would be dangerous to apply this method elsewhere than to erectile tumors upon the cranium, some regions of the face and fingers, or to the dorsum of the foot or hand.

B. *Ligature upon the small Arteries.*—Nothing could be more rational than the idea of destroying erectile tumors by tying the arteries which are

distributed to them; from whence it happens that this is an operation which can now count a great number of trials. Unfortunately it is one also which has frequently resulted in failure. A surgeon mentioned by Bell, successively tied the temporal and angular artery, for a tumor which occupied the upper eyelid. A cure did not take place, and Bell was obliged to proceed to the extirpation of the fungus. It is also said that in the case of a tumor situated upon the forehead, the ligature applied to the arteries in the neighborhood by M. A. Cooper (*The Lancet*, 1829, t. II., p. 559) did not prevent the tumor from progressing. M. Brodie in a case succeeded by means of two needles placed crosswise and a strong ligature. M. Roux tied the labial, facial and transverse arteries for a fungous tumor of cheek and upper lip. The compression also used at this first operation, brought on inflammation and a slight degree of suppuration. The tumor appeared to diminish in extent, but at a later period extirpation had to be resorted to. A strong robust tanner, aged about thirty, had the entire upper lip transformed into erectile tissue of a vinous or violet color. I applied a ligature to the upper coronary artery, first on the left side and four days after on the right side. To be more sure of letting no arterial branch escape, I had taken the precaution to incise through the whole thickness of the lip vertically from a line with the ala of the nose, to the vermilion border below. Having tied the two ends of the artery, I united by suture as in hare-lip; I proceeded precisely in the same manner for the second operation as for the first. During about the space of fifteen days, the lip grew paler, and sensibly diminished in thickness; but it soon became the seat again of pulsations, and ultimately resumed the state which it was in before the operation. Pelletan, who after the surgeon mentioned by Bell, appears to have been the first who made trial of the operation in question, in order to arrest the development of an erectile tumor upon the cranium, cheek and ear, proceeded, after having tied the temporal artery, to apply his ligature also upon the occipital. Successive hemorrhages came on and the patient died on the fourteenth day. A patient operated upon by Dupuytren (Hodgson, *Traité des Mal. des Artères*, p. 300) for a similar tumor, had also undergone without success a ligature upon the temporal, auricular and occipital arteries. I have elsewhere said (vid. supra) that the ligature upon the small arteries had also failed in the hands of M. Brodie, M. Syme, (*The Lancet*, 1829, p. 596,) and many others. A ligature applied by M. King (*Tarral, Op. cit.*, p. 24) to the temporal artery, for a nævus on the upper eyelid, also failed to effect a cure.

It is therefore one of the most uncertain operations; and in fact how are we to obliterate all the arterial branches which arrive at the circumference of such tumors? Isolated ligatures clearly address themselves only to the branches of a certain volume, those whose pulsations are perceptible under the skin, or whose anatomical relations are well known. But who does not know that an infinity of minor arteries, of the smallest calibre, and the capillaries, must necessarily exist between the principal branches; then how can we be assured that the deep-seated surface of these tumors does not receive other arteries of sufficient size to replace those we have just obliterated?



C. *Ligature on the Principal Arterial Trunks*.—The difficulties I have pointed out, and the failures I have related, have induced practitioners to extend the ligature to the principal artery itself of the region occupied by the disease. Thus have the carotid arteries been tied for tumors of the head, the brachial and the arteries of the fore-arm for tumors of the thoracic extremity, and the femoral for those of the abdominal limb.

I. *Arteries of the Head*.—It was in 1809, that M. Travers tied the primitive carotid for an erectile tumor upon the orbit. M. Dalrymple, his countryman, did the same for a tumor very similar. The two patients recovered. Two similar operations were performed by M. Wardrop, for erectile tumors upon the face. One of the children died on the fourteenth day, in consequence of hemorrhage and suppuration; the other got well. In a third case also, M. Wardrop tied the primitive carotid, having obtained no benefit from a ligature on the temporal and frontal arteries: the patient died. An analogous operation, by M. Walther, also proved unsuccessful. The tumor was seated on the temple. In the case of M. Davidge, the patient was seized with trismus and died at the expiration of six weeks. That of M. Pattison appears to have been completely cured. In these two cases the tumor was in the cheek. M. Maunoir failed entirely in his operation; and the same occurred with M. Dalrymple in a second trial with it. The case of M. Maehlaehlan was one of varicose degeneration of the arteries of the hairy scalp, and the patient died. It would appear that the patient of M. McClellan, who had an erectile patch over the whole right side of the face, at least derived some advantage from the operation, if in fact the cure has not been entirely completed. An erectile tumor of the antrum highmorianum was cured in this manner by Dr. Hall. So also in a patient of M. Arendt, who had an erectile tumor on the upper eye-lid; but it is necessary to be added here, that the surgeon afterwards made a crucial incision through the tumor, that he successively tied twelve small arteries, that many hemorrhages still took place, and that it required four months for the cure to be completed. The man operated upon by Delpech had an erectile tissue in the nasal fossæ, and at first only appeared imperfectly cured. An erectile tumor upon the temple, which M. Willaume treated by a ligature upon the primitive carotid, did not diminish. The patient operated upon successfully by M. Busk had an erectile tumor in the orbit. That of M. Roux, in which the tumor also occupied the orbital and temporal region, was but imperfectly cured, when he was lost sight of.

If the persons operated upon by MM. Bernard, Rogers, and Buseh, were cured of their erectile tumors by a ligature upon the carotid artery, we find that the operation did not succeed in the case of M. Jameson, and that it was followed by death in those of MM. Kuhl, Mayo, Zeis, Peyroff, and in that of mine, and that it failed also in the patient in whom M. Mussey applied successively the ligature upon both carotids. As to the patient recently operated upon at Marseilles by M. Martin, (*Lancette Fr.*, t. XII., p. 486,) we are yet unacquainted with the benefit he will derive from a ligature upon the primitive carotid. (See the Table of Ligatures upon the Carotid, *supra*.)

[Mr. Crisp (On the Blood-vessels, p. 275) has collected the statistics of numerous cases of capillary, and circoïd aneurism treated by the various methods of excision, cauterization, the ligature of the arteries &c. &c. In 16 of these cases, he states that the carotid artery was tied, and in 3 both carotids were tied. "The ligature alone was successful in five cases; in seven operations benefit was derived from the tying of the vessel, and the disease was afterwards removed by pressure, caustic, or excision. In the three fatal cases, the patients did not appear to die from the immediate effects of the operation. Although the ligature of the common carotid (when the disease is seated in the head and face) does not in the majority of instances, of itself effect a cure, yet it is probable that by reducing the supply of blood to the tumor, the calibre of the artery is so diminished that excision and other means may be employed with a better chance of success." (p. 278)]

In his recently published work on operative ophthalmic surgery, Mr. Haynes Walton has reported a successful case of ligature of the carotid for the removal of an erectile tumor in the orbit. A still later account giving the subsequent favorable progress of the case appeared in the *London Med. Times and Gazette*, Feb. 1854, p. 185.

In a case of circoïd aneurism of the scalp, the late Dr. J. Kearny Rodgers, some years since, tied the primitive carotid of one side, and some four years afterwards, that on the opposite side was secured by Dr. Van Buren. From information derived from the latter gentleman, this proceeding had not produced any material benefit. Dr. Mussey, during the past year, performed his second operation of tying both primitive carotids for this affection, and we believe that the last derived more advantage from the operation than his former patient. In a similar case, M. Auvert, tied the primitive carotid on one side, but the patient died from the effects of the operation. A patient, on whom Dr. A. C. Post secured one carotid, was materially benefited. We have already referred to the cases of fungoid growths from the antrum, successfully treated by Dr. Mott and myself, by the ligature of both carotids. G. C. B.]

It results from these details that the ligature upon the carotid artery is far from being sufficient always for the cure of erectile tumors of the head. It is to be remarked that these tumors upon the temple and external part of the head have less frequently disappeared under the influence of this operation than those of the orbit, eye-lids, nose, cheeks and sinus maxillaire. The patient operated upon by Delpech, and in whom the erectile tissue occupied the septum nasi, appears at the present time to be definitively cured; for in the notice of the case of M. Martin, it is stated that he still lives at Marseilles, in a state of perfect health.

I have mentioned that those who were cured by M. Travers, M. Dalrymple, M. Arendt, and M. Busk, had the tumor in the orbit or eye-lid; that in those of MM. Pattison, McClellan, and Hall, it was situated upon the side of the face; while in that of mine, that of M. William, that of Dupuytren, that of M. Walther, that of M. Machlachlan, one of those of M. Wardrop, and some others, it was located upon the temple or cranium. If the erectile tumors only of the orbit had terminated favorably, it might be explained perhaps, by recalling to mind with MM. Roux and Hervez, that the ophthalmic artery here forms a small vascu-

lar system in some sort independent, whose functions would necessarily be interrupted by a ligature upon the carotid : but the same (successful) result having taken place upon other regions of the face, we can scarcely attach any importance to this arrangement.

However that may be, it would seem that erectile tumors upon the head, which are to be treated by a ligature on remote arteries, ought not to be so attacked without discrimination by the obliteration of the primitive carotid ; for myself I should prefer that those of the chin, lower lip, and even upper lip, should be treated by a ligature upon the two external maxillary arteries, and those of the floor of the mouth and the tongue by a simultaneous or separate ligature upon the facial and lingual arteries. For tumors on the exterior of the cranium I should tie the carotid or the two secondary carotids at the same time with the primitive carotid. If the disease occupied the nose or antrum highmorianum, I would confine myself to the ligature of the external carotid, immediately below its division into the temporal and internal maxillary arteries. Finally, in cases of erectile tumors of the orbit or eye-lids, I would tie the internal carotid alone, or the internal and primitive carotid. We have, moreover, seen in the table cited above, that these operations are sufficiently serious and sufficiently often fatal to inspire the minds of surgeons with well-grounded fears. We should therefore not decide upon them unless the disease has acquired a great development, menaces the life of the patient, or really constitutes a deformity of a grave character. I will add, that we ought not to come to this resolution, until after having made trial of topical applications, compression, vaccination, tatooing, and cauterization, in the cases of superficial tumors ; acupuncture, le broiement, multiplied setons, and irritating injections, where they are thick or deeply situated ; also that we should take into consideration whether extirpation, supposing it practicable, ought not even then to have the preference to the ligature in question.

II. *In the Limbs.*—A ligature upon the principal arterial trunk appears to have been but rarely followed by success in the cases of erectile tumors. I have already said, that in tying the arteries of the forearm for a tumor on the fore-finger, M. Hodgson had failed completely. In a case cited by M. Chelius, (*Handbuch der Chir.*, t. I., p. 884, Heidelberg and Leipsic, 1826,) an erectile tumor upon the knee equally resisted a ligature upon the femoral artery. The same operation, performed in 1819, by Dupuytren, (Breschet, *trad. de Hodgson*, p. 26, ou *Répert. d'Anat. et de Phys.*, etc., t. II. ; *Arch.*, t. XIII. p. 459,) for a vascular degeneration at the lower extremity of the femur, was no less unfortunate. Nevertheless, MM. Roux, (Tarral, *Archiv. Gén.*, t. VI., p. 26, 2e série,) Graefe, (*Gaz. Méd.*, 1835, p. 169,) and Chelius, appear to have each succeeded once in curing erectile tumors of the forearm or hand, by tying the neighboring artery ; and M. Lallemand, (*Bull. de Ferrussac*, t. XV., p. 73 ; *Arch. Gén.*, t. XIII., p. 544,) by obliterating the crural artery, has been no less successful in a case of vascular degenerescence upon the tibia. So that under this point of view, the successes and reverses are, up to the present time, in some sort balanced.



Be that as it may, erectile tumors upon the limbs, which occupy only the integuments, or sub-cutaneous tissue, seem rarely disposed to yield to the ligature upon the principal artery. The branches which penetrate directly into the tumor should be attacked by preference, whether by the circular section in one or several stages, or by the ligature, properly so called, on each small artery. As to the tumors more deeply situated, those especially which have been noticed in the tissue of the bones by Pott, Pearson, Scarpa, Rossi, Dupuytren, Roux, and Lallemant, of which I also have met with two examples, inasmuch as it could be amputation only of the limb that we could oppose to them, and that they have already been sometimes observed to recede after the ligature upon the principal arterial trunk, I am of opinion that it would be advisable to submit them to this last operation. In such cases, though the ligature upon the artery should offer but one chance of cure out of three or even out of ten cases, still it ought to be preferred. For supposing that it should not result in a cure, it would not prevent our proceeding at a later period to amputation if that should be found necessary.

What I have said further back, however, shows that we should err in reposing entire confidence in this kind of remedy, and that the erectile tumors of the bones of the limbs resist, as often at least as those of the head, the ligature on the arteries which nourish them. We ought not, therefore, to prefer this means, except where all the others I have hitherto mentioned are impracticable. The circular section for the tegumentary tumors; the ligature of the sub-cutaneous arteries, and as near as possible to the tumor, when the fungus penetrates as far as to the fascia superficialis; the ligature to the principal trunk by the method of Anel, where the bones or deep-seated parts of the limb appear to be the seat of the evil; such is the order in which this kind of operation should be placed in a practical point of view.

#### § XIV.—*Extirpation.*

In former times, erectile, like all other tumors, were fearlessly submitted to extirpation, but J. L. Petit, J. Bell, Callisen, Dupuytren, and MM. Wardrop, Roux, and Walther, have inspired so much apprehension in regard to the operation, that most surgeons no longer decide upon it except in cases of extreme necessity. The accident the most formidable and the most frequent of this operation, is hemorrhage. A patient died thus in some sort under the knife of M. Wardrop; the same occurred in a patient of M. Roux. The same practitioner, on another occasion, was upon the point of losing a second patient, before having terminated the operation. Two patients also of M. Hervez de Chegoïn, caused in the mind of that surgeon the greatest apprehension. M. Bushe, after having excised an erectile tumor from the temple in an infant aged thirty months, perceiving the hemorrhage recur, was obliged to resort to a ligature upon the external carotid.

Nevertheless, these dangers rarely take place, except in cases where the tumor is badly defined, or where it is impossible to cut exclusively upon the sound tissues; and experience proves that, practised in such manner as to remove the erectile production entire, and in addition, a

breadth of unaltered integuments, extirpation is still the most sure and the most rational of this order of remedies. What prevents it from being proposed for all cases, is the deformity which must necessarily result from it, when the tumor occupies a very extended surface, or the depth and uncertainty of its limits, when it is situated either in the central portions of the limbs, or in the cavities of the head.

F. De Hilden, who had already perceived the importance of this operation, positively recommends that in extirpating the tumor, we should leave no vestige of it, but carefully remove all its roots. Turner (*Malad. de la Peau*, p. 234) mentions, on the authority of Willis, erectile tumors which had been extirpated without danger in his time. Warner, (*Obs. de Chir.*, p. 68,) in operating in this manner upon the forehead, had been no less fortunate. Alanson, (*Manuel de l'Amput.*, p. 199,) while extirpating from the forehead of a child of seven years of age, an erectile tumor of more than an inch in extent, caused, by way of precaution, compression to be applied all around it. We may find also in the work of M. Maunoir (*Memoire sur le Fungus Hématode*, p. 90 à 100) some examples where extirpation of these tumors was performed with entire success. Others of the same kind will be found in the memoir of Briot, (*Progrès de la Chir. Milit.*, p. 298; *et Dict. des Sc. Méd.*, t. XVI., p. 334.) M. Champion extirpated one in a woman, aged 25 years, which was situated upon the upper and anterior part of the arm, and was of the size of a pound loaf of bread. M. Roux (Maréchal, *Révue Méd.*, 1825, p. 29) succeeded perfectly in a case where Dupuytren was not willing to venture upon any remedy. An infant, aged eighteen months, had upon the outer angle of the right eye an erectile tumor of the size, form and color of a calf's kidney, M. Lœrean, (Communicated by the author, 29th September, 1837,) having effected the extirpation of this tumor, employed the suture, in order to unite by first intention, and obtained complete success. An erectile tumor, which occupied the labium majus of the left side of a woman aged twenty-nine years, was extirpated with success by M. Pl. Portal, (*Clin. Chir. etc.*, p. 142.) After having extirpated one of these tumors on the fore part of the thigh, the same practitioner (*Ibid.*, p. 141) was obliged to cauterize the wound many times, with the butter of antimony, the nitrate of mercury and the nitrate of silver. In an infant, fifteen months old, and who, among other erectile tumors, had one of an inch and a half in diameter on the root of the forehead, between the eyebrows, the operation of extirpation which I had forbidden from fear of too deformed a cicatrix, was performed with success in 1837 by another surgeon of Paris. The facts of this kind, however, at the present day are so numerous that there is no necessity of making particular mention of them.

Extirpation in these tumors, in order that it may offer real chances of success, exacts several conditions; first, that the instrument should remove everything; secondly, that we should have it in our power to make compression with a certain degree of force, either at the bottom or on the periphery of the wound as well as upon the principal arterial trunk of the neighborhood; finally that the surrounding tissues should be free from every kind of vascular degeneration; when with these it should be possible to unite by first intention, without making traction

upon the parts, we could desire nothing more ; but should it become necessary to dress flat, the operation might still succeed if the other conditions which I have just pointed out, were actually present. An erectile tumor, six inches long, of the form of a calf's tongue, and which had existed from the age of seven years on the outer and upper part of the left leg of a female, and which had been unavailingly treated by compression, and transformed by this means into a vast pouch, was extirpated with complete success by M. Néve, (Communicated by the author to M. Champion,) though he was not enabled to unite by first intention.

Moreover, I should not confine myself to extirpation, as M. Ouvrard recommends, (*Obs. de Méd. et de Chir.*, p. 374—379,) for the removal of purely vascular tissue, unless cauterization, in such manner as to preserve the healthy tissues which envelop the disease, should be afterwards associated with it, as it was on one occasion successfully by M. Bedor (*Journ. Hebd. Univ.*, t. II., p. 369) for a pediculated tumor of the cranium.

In the young person whom I have spoken of in the paragraph on multiplied setons, I was desirous of preserving the skin which was sound. Having freely dissected the parts, I removed the whole tumor, together with about an inch and a half of the radial artery which was included in it. The blood flowed abundantly ; but tamponing with small balls of lint and compression sufficed to arrest it, after a ligature had been applied to the two ends of the radial artery. The wound regularly cicatrized ; but as I have already said, a point on the skin, and some subcutaneous protuberances, give me at the present moment, (January, 1839,) some fears in respect to the return of the disease. I should remark that the tumor in this case was badly defined, and that a multitude of dilated vessels were given off from it like so many rays from its circumference. M. Lallemand, (*Arch. Gén. de Méd.*, 2e série, t. VIII., p. 5,) in one case, effected a cure by extirpation, though the tumor occupied the gums, and that he was obliged, at the same time, to remove the whole breadth of the lower alveolar border. M. Nichet (*Rév. Méd.*, 1838, t. III. p. 242) was no less fortunate in a case in which he performed the operation of cheiloplasty, after having extirpated the tumor which was situated upon the lower lip and a part of the cheek. A livid irregular, hard tumor of the size of a nut, had existed for many years between two heads of the metacarpal bones on the dorsal side of the root of the medius, in a girl aged eleven years. I extirpated it without interfering with the neighboring articulation, and the cure has remained complete since the month of July, 1838. The operative manual has nothing special in such cases, except that it should be submitted to the rules of incisions in general, and exact great precautions in relation to the employment of provisional and even definitive hemostatic means.

#### § XV.—Amputation.

The tendency of erectile tumors to repullulate, the dangers attending their extirpation, the difficulty of attacking them when they have invaded the interior of the limbs, have suggested the idea of performing ampu-



tation for the cure of some of these cases. This operation, the propriety of which has been especially treated of by M. Maunoir and M. Hervez de Chégoin, is not in my opinion justifiable in any case at the outset. I should not decide upon it but in the last extremity, after having vainly essayed all the other methods, and where the disease actually compromised the life of the patient by the rapidity of its progress, or had permanently destroyed the functions themselves of the part where it was situated.

Erectile tumors of the bones only could justify recourse to it, and not then even as I have already said, should we come to this determination, until after having fruitlessly made trial of a ligature upon the principal arterial trunk of the region. If with MM. Maunoir and Hervez we should sometimes have recourse to amputation, it would be solely in those cases where melanotic, cerebriiform or scirrhus productions have become implicated with the erectile tissue. The question, then, would be of a cancerous tumor, and no longer one that was purely fungous; and the chances of the operation whether fortunate or unfortunate, would have to be weighed after the known nature of cancers, and not from what has been said of sanguineous tumors. The cases of a return of the disease mentioned by M. Maunoir, M. Fine, (*Journ. Gén. de Méd.*, t. XLV., p. 46,) and M. Gérard, (*Journ. Univ. Hebd.*, t. II., p. 413,) and by a multitude of others, are not sufficient to authorize us to say with M. Hervez, (*Journ. Univ. de Méd.*, t. II., p. 22,) that the removal of accidental sanguineous fungous tumors of the limbs, has never been followed by success, and that, therefore, amputation is preferable. The case of M. Nève and that of M. Champion, would alone suffice to refute this proposition.

[The pain produced by erectile tumors on the foot or leg is sometimes so great as to require amputation of the affected limb. An interesting case of this kind has been reported by Mr. Fergusson (*Lond. Lancet*, Am. Ed. June, 1851, p. 530.) The previous ligature of the femoral artery had proved of no benefit. Prof. Parker has amputated under similar circumstances, for a report of which, drawn up by the patient, himself a physician, we must refer the reader to the *New-York Journal of Medicine*. The pain in this case was very excruciating. G. C. B.]

### ARTICLE III.—GENERAL APPRECIATION.

I have described with some detail the different kinds of operations hitherto proposed against erectile tumors, because, though there may be none of them which are suitable to all cases, there is not one of them which ought absolutely to be rejected. Erectile tumors present so much diversity in respect to their breadth, thickness, and layers, the regions they attack, and their nature and progress, that it is impossible to submit all of them to the same kind of treatment. Thus topical astringents, styptics, and refrigerants, applied to tumors that are superficial, of but little extent and still recent, are calculated to procure some successes. Compression alone, or aided by these last-named measures, if continued for a long time, will succeed in some cases wherever it is possible to apply it conveniently. Compression also though less active and less

powerful than caustics, might be made trial of with astringents in cases of sub-cutaneous, diffused and irregularly flattened tumors. However, it will always be found one of the remedies which are the least to be depended upon, and one on whose efficacy we must not deceive ourselves. Cauterization, by means of potash and ulceration, having the advantage of not alarming the patient, and of succeeding sufficiently often, should have the preference where the tumors are cutaneous, irregular, and too large to be extirpated. [This is a very favorite and successful remedy with Dr. Mott in such cases, where the red-hot needles cannot be applied, or do not succeed. His next great reliance is extirpation or excision, at a suitable distance from the periphery of the disease, so as to cut into a margin of sound tissue. T.] In cases of flat and regular tumors, it is much better to recur to cauterization *en nappe*, [vid. supra,] whether by means of a fragment of caustic potash, or with a pencil, slightly wetted with nitrate acid of mercury. If the whole thickness of the dermis should be affected, we should succeed still better by covering the whole degenerated patch, which has been previously denuded of its epiderm, with a layer of zinc paste, or the Vienna caustic; or by applying to it the red-hot iron.

Vaccination and tattooing would not be suitable, except the first, on some fungous masses imperfectly circumscribed; and the second for *nævi* of the most superficial character and least thickness: it is even doubtful if these methods deserve to be retained in practice, under any consideration.

Nor does *broiement* (or breaking up of the tumor) appear to possess any very great value; I would not make trial of it, but for bulky tumors of a certain volume, and which it would afterwards be easy to compress. Having transformed them, by means of the needle, into a sort of sanguineous depot, I would immediately treat them by topical astringents and compression. It is in similar cases that irritating injections might be made trial of; but, as with *broiement*, they ought not to have the preference, except in regions where it might seem too dangerous to carry the cutting instrument, or in patients who have an excessive dread of bloody operations. I have said, farther back, what we may expect from the employment of setons and needles. I will add, that it would be a loss of time to attack, in this manner, flat and superficial erectile tumors, and all those, in fine, which are situated in the integuments, in the form of a layer.

Every pediculated erectile tumor may be destroyed by the ligature, in the same way as ordinary tumors; we have thereby the advantage of not exposing the patient to the risk of any hemorrhage, and of obtaining a radical cure, if the ligature is accurately placed upon sound tissues. We would not pass a needle behind the pedicle, unless the skin was so much compromised [in the degeneration] as to induce us to fear that the thread might slip upon tissues which it would be desirable to remove. Two needles, placed crosswise, would be necessary, if the tumor was flat or presented a root of some considerable size. A double ligature, passed behind and through the pedicle of the tumor, possesses the advantage of cutting through the tissues with a little more rapidity than one ligature only, placed externally, and also that of being more

readily placed at the bottom of cavities than the ordinary ligature, or ligature under pins. In all cases the ligature is desirable, where we have great apprehensions of hemorrhage, and in young children.

The incision of the periphery of tumors cannot be of advantage but for *nævi*, properly so called, or those that are purely cutaneous; also it would be required that the skin should be almost naked on the bones, and that it is deemed of extreme importance not to deform the diseased organ. Except upon the fingers, eye-lids, nose, lips, and ears, this operation does not deserve a preference over excision, of which it possesses almost all the inconvenience, without offering its advantages. Incisions, properly so called, whether simple, as they are employed in Prussia, or associated with partial excision, as practised by MM. Ouvrard and Lallemant, would not deserve to be made trial of, except in similar cases, and even then it would be well to associate with them the employment of setons, caustics, compression, or topical applications, if the thing were practicable.

A ligature upon the arteries of the fungus itself will never be proper, unless we should see them pulsate under the skin, and that they were well isolated, or the tumor too large and too thick to be attacked by cauterization or extirpation. Before deciding upon this, we should have made trial of most of the methods which I have just described. It is only, moreover, upon the cranium and face that it would be advantageous to proceed in this manner. As to the ligature upon the principal arterial trunks, as it is of itself a serious operation and fails in one case out of three, it should never be thought of, when the tumor occupies only the dermis or the sub-cutaneous layer, unless it is one of a very large size, and which has already resisted all other means. We should reserve it, then, for those erectile tumors which it is not practicable to attack with security either by caustics or cutting instruments, or for those of the cavities of the cranium and face, for example, and those of the osseous tissues and interior of the limbs.

As to extirpation, though it be in reality the *best method of all*, when the tumors are well defined, cutaneous, or sub-cutaneous, we should not, however, propose it to persons who dread it; above all, not until after having in vain made trial of one of the others; but we should come to it at first, if there are no personal objections opposed to it, and in all cases where we would be enabled to unite the wound by first intention, and in all regions where a large cicatrix can have nothing about it of a revolting character. We should also, moreover, decide upon it when the other methods have failed, especially when it may be in our power to guard against the hemorrhage to which it may give rise, and in all those cases where there is no choice left but this and amputation, properly so called. I have no necessity of recurring to the limitations which I have assigned above to this last resource.

#### [ERECTILE TUMORS.]

*Treatment of Erectile Tumors, particularly Nævi Materni.*—Though we have taken occasion in the first volume of this work, to enforce the necessity of adopting in every case where it may be possible, the method now generally practised in this country, by Dr. Mott and others, of



treating those congenital meshes of aneurismal vessels, (chiefly venous in most cases undoubtedly,) in infants and children, which are known more generally as *nævi materni*, sometimes as *aneurism by anastomosis*, and in France, (as improperly designated by Dupuytren,) *erectile tumors*, (see Vol. I,) we must again allude to it here, which is perhaps, its most appropriate head.

It has often been justly remarked, and the same observation, is, as we perceive in the discussions in the Academies at Paris, coming more into repute every day, that the apparent rudeness, boldness, and severity of the practice of *veterinary surgeons*, who in Europe are educated men, and of scientific attainments and respectable rank, and who have no responsibilities or interferences to contend with, except the single aim and end of effecting a cure of their patients, has been of itself the providential means of paving the way for some of the most daring and brilliant operations in human surgery. Take the section of the tendo Achillis, and the use of the hot iron as examples, (see Vol. I;) to the latter of which remedies, surgery, as regards the human species, has also at last, step by step arrived in the treatment of the disease in question, one of the most common, and also unfortunately one of the most formidable, at least in its deformity, of all the *opprobria medicorum*.

From immemorial time deemed among the number of those congenital misfortunes or blotches, which were beyond the reach of surgical art, no serious effort was scarcely ever undertaken for their removal. Finally, without pretending to add anything to the erudition of their early history as given by the learned author of this work, M. Velpeau, we shall proceed at once to say, that all therapeutic means, surgical or medical, have it may be alleged, proved in too many instances utterly impotent, or what is worse, sources of aggravation to the existing malady.

Thus, to say nothing of the occasionally radical cure by extirpation, the most ingenious and efficacious of all methods up to the time of the method by *perforation with red hot needles*, or the *American process*, as it may be emphatically called, was undoubtedly that of M. A. Bérard, or that of the application of the *Vienna Paste*, or *Caustic*, as modified by him, and which undoubtedly owed also all its value to its severity and boldness. M. Bérard, (*Mém. sur le Traitement des Tumeurs Erectiles*; par M. A. Bérard, Membre de l'Académie de Médecine, Paris; Chirurgien de l'Hôpital de Necker—in the *Journal des Connaissances Medico-Chirurgicales*, Paris, December, 1841, p. 249, et seq.) employs the Vienna Powder which is composed of lime and caustic potash, according to the mode of preparing the same in the *Codex*, by making it into a soft homogeneous paste, by mixing it gradually with a little rectified alcohol, and then spreading it in a thin layer over all the tumor, except within a few lines of its circumference, that marginal portion of the *nævus* being sufficiently impregnated with it by means of the imbibition of the solution of the potash in the alcohol. The paste is to be completely washed off in the space of from five to ten minutes.

But although this surgeon at the time of publishing this memoir, gave this mode a decided preference over all others, and had used it, he says, with great advantage in more than thirty cases, yet it is clear from his description that there is much danger from it, by the copious hemor-

rhages it may produce, and also the necessity of one or more re-applications of it on account of its not executing its office effectually, or from the liability of a return of the disease.

The process of M. Lallemand of Montpellicr, was undoubtedly nearer the mark in its inception, so far as the real mode of cure, was in some measure shadowed out by him in this first step. He, in fact, following out M. Velpeau's process for varicose veins, and perhaps also M. Velpeau's suggestion of the *hot iron* to *nævi*, (see text above,) inserted in various directions, and repeatedly through the tumor, pins, which were left there until suppuration was effected through their track. M. Bérard objects that they did not in his own hands prove sufficiently exciting, on which account he substituted *ivory pins*, which one, *a priori* would say, were much less so than the metallic bodies; and to effect his object more completely he superadded the complication of a *platina syphon*, with a glass canula attached, in order to inject in the tracks of the ivory pins, the *nitric acid of mercury*. But the inflammation and suppuration here again proved too violent, besides causing subsequent indurated growths, on the part, and endangering the whole constitution, if not life, by the imbibition of so dangerous a poison as the fluid used for injection. Finally, M. A. Bérard abandoning all other modes, adopted that which (as will be seen in the text above,) had long before been made trial of, to wit: *numerous setons*, by means of which he strangulates the tumor, and had up to the time he wrote, thereby succeeded in every case in which he had tried it.

To all these must now give place in the generality of *næval tumors*, and when not too deeply involving the subjacent tissues, the process most in repute in this country, or the *American method*, which as we have stated, (Vol. I.,) we will now repeat, consists in the rapid and successive application of slender, delicate steel pins of from two to three, and four inches in length, furnished with firm, short, small wooden handles, and kept near by, heated to a red heat in a small chafing dish of coals.

The pins are inserted one after the other transversely and horizontally, and as near the union of the base of the tumor to the skin, or sub-cutaneous and dermoid tissue as possible. They literally *burn their way through*, and at the same moment *roast an eschar* in their passage, which becomes the new wall to the track they have made. As soon as one pin is inserted, it is immediately withdrawn. This is followed by a second, and so on, going close to the track of the preceding, until the whole diseased mass, and congeries of vascular canals is actually riddled, broken up and converted into one eschar as well as isolated from the healthy parts underneath by one continuous layer of the same. A healthy, and most salutary action, just enough to accomplish the object in view, and no more, is thus set up within, and at the base of the tumor, while the latter is transformed immediately into a superincumbent incrustation, that becomes detached as soon as the new reproductive granulating process underneath has completed the cure. Very little, or no suppuration, and never any bleeding ensues. In fact a better hemostatic means could not be devised than the operation itself, which thus finishes up as it goes, every thing required, producing very little pain, and that mo-

mentary, and leaving no subsequent steps to be taken by the surgeon himself, scarcely even a common dressing. Adroitness however, is required in the proper application of these red hot needles, and the operation has sometimes to be repeated.

Dr. M. Hall proposed, as early as in 1831, (*Lond. Med.-Chirurg. Rev.*, April, 1831; *New York Medical Journ.*, Vol. II., No. 1, p. 184,) to cure nævi by introducing *horizontally* and eight or ten times through the tumor near its base on or in the skin a *couching* needle with *cutting edges*. He thus cured one over the size of a shilling. This process required only the *red heat* to the needles to give it the perfection it now has. Mr. Liston, (*Cormack's Journ.*, Oct., 1843, p. 943; *London Lancet*, April 1st, 1843, p. 27,) in 1843 removed an erectile tumor from the popliteal space in a boy, aged 10 years, which had existed there from the age of 2 years. It was situated deep, and was completely covered with the fibres of the semi-membranosus muscle, which was the cause, no doubt, of its presenting such obscure diagnostic marks to the touch, being represented as doughy, fluctuating, solid, elastic, fatty, &c. A seton had been passed through it, and a discharge established without any benefit. It was moveable and distinct from the bone: when cut into during the operation much blood was discharged from it, and also much in its neighborhood. On the 16th day the boy was perfectly well. The tumor, Mr. Liston says, microscopically examined, was found to be of perfect erectile tissue. Mr. Liston considers it to have been developed in the muscles with which it was connected, and instances a tumor of different structure which he removed from the side of the neck, and which he believes to have originated in the interior of the sterno-cleido-mastoid muscle, in which last case there was great hemorrhage.

*Amorphous Erectile Tumor removed by Dr. Mott.*—In June, 1845, at New York, Dr. Mott removed a tumor of the size of a turkey's egg upon the left side of the neck of a young man, aged about 25, of spare make and pale complexion, temperate habits, and otherwise healthy, which tumor was completely covered by the attenuated expanded fibres of the sterno-cleido-mastoid and omo-hyoideus muscles, and in its lower part complicated with the thyroid body and vessels. It lay obliquely on the inner margin of the normal line of the first mentioned muscle, which, however, in consequence of the growth of the tumor, had undergone in this part the distension, attenuation, and lateral expansion mentioned. In dissecting down upon the tumor, which was of the shape of a long oval, it was found, underneath its muscular parietes, to be covered with a series of pellucid or thin transparent dense membranes, like the fasciæ of femoral hernia, two or three in number, on the division of which a formidable hemorrhage ensued from the enlarged superior thyroid arteries and veins which traversed its substance, and which was found to be of an amorphous character, partly erectile and partly of thickened semi-cartilaginous and hydatid encysted tissues. In this operation the infra-maxillary artery, which also sent off branches to the upper part of the tumor, was accidentally divided, the upper end of which, during a movement of deglutition or turning of the neck, receded an inch or more upward, above and within the base of the jaw, and was not secured until after a num-



ber of unsuccessful attempts with the tenaculum and forceps. This circumstance occasioned considerable embarrassment from the large column of blood which issued from the abnormally enlarged calibre of the vessel; and had Dr. Mott not succeeded in securing it in time, it was his intention to have passed a ligature upon the common carotid, the sheath of which had been laid bare by the operation. To avoid the danger of farther hemorrhage, a ligature was passed around the root of the tumor and its adjacent connections, by which means indirect compression was thus established upon all the included vessels. About an inch of the diseased parts was thus left in the wound, together with the ends of some dozen or more ligatures which it had been found necessary to apply during the operation.

The diseased tissues included in the general ligature sloughed away completely, and the parts healed up kindly, effecting a perfect cure.

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### CHAPTER III.

#### LYMPHATIC TUMORS.

I MEAN here by lymphatic tumors, the tumors which are formed by degenerate lymphatic glands, (ganglions.) It is a class of tumors of which, up to the present, scarcely anything has been said in works upon operative surgery. Generally the treatment of them has been confined to topical applications and general remedies, (médications;) but I have long since satisfied myself that surgical processes are frequently their best, and sometimes, in fact, their only remedy. This is also, I believe, the opinion of M. Warren (*on Tumors*, etc., p. 162.) Those tumors which are sometimes the result of a simple hypertrophy of the natural elements of the organ, at other times formed by the establishment of a variable number of elots (grumeaux) of concrete pus, or of tuberculous matter, or of cysts or purulent abscesses (foyers) which are disseminated as it were, in the parenchyma of the hypertrophied ganglionic tissue, represent masses which are very tardy in contracting adhesions to the organic layers which surround them. When they have once acquired a certain degree of hardness, and have continued beyond six months or for a year, it is rare that they disappear by resolution, (i. e. resolvers.) They then rest on the tissue like so many foreign bodies, whose internal morbid action, (travail central,) usually very slow, approaches by degrees the neighboring ganglions, (i. e. lymphatic glands or ganglions,) produces an indefinite enlargement, or a fungous degeneration, or suppuration, or ulceration of the primitive masses. We may conceive, then, the advantage which would result to patients if it were possible to destroy such tumors surgically. We have in practice three modes which we may resort to in such cases with some chances of success: These are *crushing*, *setons* and *extirpation*.

## ARTICLE I.—CRUSHING.

The crushing of engorged lymphatic ganglions, which was proposed and put into practice in a certain number of cases by M. Malgaigne, is not so irrational as might at first view be supposed. The tumor broken up (*broyée*), comminuted (*morelée*), and reduced into a pulp (*bouillie*) underneath the integuments which remain intact, is then placed in conditions similar to those of a tumor formed by clots of effused blood. Permanent compression succeeding to crushing, properly so called, sometimes induces the matters thus broken up to be absorbed, and then resolution is thereby evidently rendered more easy; only that it is unfortunate that the inflammation from being chronic, often passes in this manner into an acute state, and to such degree as to sometimes transform the lymphatic tumor into a true abscess, the healing (*mûrification*) of which is then always tedious and difficult. There are also a great number of cases in which the crushing cannot be performed but with great difficulty. It cannot in fact, be undertaken but for tumors which are absolutely external, and for those which rest on some solid point of support.

M. Malgaigne, who has employed crushing only for ganglions of the groin, used for this purpose the thumb or thumbs applied with force and directly from before backwards on each tumor. In proceeding in this manner there is sometimes need of a great degree of force, and most of the tumors cannot be broken up by this mode. There might also, perhaps, be danger in this region of doing some mischief to the femoral artery. In that region, as well as in the axilla, and under the jaw, and in the neck, I have found it answer better, when the condition of the parts allow of it, to seize the tumor between the fingers or between two smooth pieces of pliant wood, and thus to compress it with a sufficient degree of force upon the sides, and successively upon all the points of its circumference. Many lymphatic ganglions, treated by this process, have, as it has appeared to me, restored themselves afterwards with a promptitude which the long duration of the disease had scarcely permitted me to hope for. But I hasten to declare that crushing nevertheless, is a method which is exceedingly uncertain, and one that cannot be attempted but in a very small number of cases.

## ARTICLE II.—SETONS.

M. Levancier, a surgeon of Toulon, asserts that he has succeeded in effecting the rapid dispersion of inguinal tumors of very long standing, by traversing them with small setons. These consist of simple threads, which are passed by means of a needle through the entire thickness of the ganglion, in which they are left to remain for four, five or six days, and then withdrawn to be replaced by new ones in different directions. One, two, or a greater number of threads are introduced in this manner at the same operation or after an interval of some days, in the same way nearly as I have said in speaking of erectile tumors. The suppuration which is established in the track of each of these threads soon reduces the engorgement of the ganglionic tissue

and the molecular or interstitial absorption of the tumor afterwards continues to go on without interruption to the termination of the cure.

Without conceding as much confidence to this method as M. Levanier, which moreover I have as yet employed but on two occasions, I nevertheless believe it worthy to be made trial of, especially for ganglions that are of little volume, situated in regions where extirpation would be dangerous, and existing in patients who prefer submitting to all the uncertainties of doubtful processes, rather than recur to the resources of a cutting instrument.

### ARTICLE III.—EXTIRPATION.

Up to the present time, lymphatic ganglions have not been subjected to extirpation but by a very small number of surgeons. The reason of this peculiarity is owing to two circumstances: 1, lymphatic ganglions scarcely ever become engorged or degenerate except from the influence of remote causes; so that there are almost always a certain number of them diseased at the same time, and that it is rarely possible to remove them all; 2, considered as the result of the disease denominated scrofulous, they have been deemed to form only a symptom, or indication (*ombre*) of a general affection, so that their removal would remedy nothing, or the least important element only of the malady. In this matter we must understand ourselves correctly. If the lymphatic tumors are in reality imputable to a general constitutional affection, their extirpation should not be attempted. It is the cause which we must first attack and not this feeble symptom. Nor should we moreover extirpate them, when, notwithstanding they have been produced by an external cause, they are numerous and diffused, [*disséminées*—i. e. existing in various regions. T.] But if there be one only, or if notwithstanding their number, they are well isolated and easy of dissection, we are not to hesitate. If there is reason to suppose that the constitution is good, and that the interior of the splanchnic cavities is not compromised, their removal offers incontestable advantages. Different also from cancerous tumors, degenerate lymphatic tumors possess also this remarkable feature, that the extirpation of those that are most diseased or most voluminous, rather favors than prevents the diminution (*dégorgement*), resolution or dispersion of the others. Thus have I frequently confined myself to the extirpation of a single one, or of a certain number of these tumors, though I knew perfectly well beforehand that I should be obliged to leave many others. Having thus extirpated those which were ulcerated, or very salient externally, or those which occasioned most inconvenience and deformity, I have frequently noticed that the others continued in the same condition they were before, or that they afterwards imperceptibly disappeared. Moreover, those that have advanced farthest being destroyed, nothing prevents our healing the others by the same topical applications, and of submitting the patient to the different courses of general treatment which are deemed to possess the greatest efficacy. When we reflect upon the manner in which these tumors terminate by suppuration, and upon the character of the ulcers, burrowings (*décollements*) and cicatrices which they establish in the skin, even when they get well without an operation, we may well be permitted to consider the



advantages which their extirpation might procure. The extirpation having been once decided upon, there is no serious preparation required for the patient: if the skin is not changed and the tumor be not of a large size, we may confine ourselves to a simple incision of the integuments. In the contrary case, we comprise the degenerated tissues in an elliptical incision more or less elongated, as in the extirpation of any other kind of tumors. In the place of the T or crucial incision which are generally preferred when the tumor is of a large size, I am in the habit of substituting the semilunar incision, so as to construct a flap which is reversed from the free border to the base, and which allows of every possible facility for the rest of the operation. The incision of the integuments having been effected, the surgeon proceeds to the dissection of the tumor. In the event of this being occupied by cysts or purulent or tuberculous layers, we should be cautious not to excise their tissue. In whatever way we proceed, it is better to hook fast of the tumor with a simple or double erigne, which should be then immediately consigned to the care of an assistant. Then holding the parts asunder by means of the fingers or forceps, the surgeon divides and detaches them with caution by means of a straight bistoury. As these tissues are only superposed upon (appliqués) or cling loosely around [collés—means here to invest, or to be loosely attached to, T.] the ganglion, it is generally easy to isolate them from it. Also the enucleation [of the tumor] by means of the finger or the handle of the scalpel ought in these cases to be substituted for the cutting instrument, whenever we perceive that there would be any actual danger of wounding the large sized vessels or nerves. On the other hand, masses to be extirpated that have no character of malignity, do not exact that we should extirpate the last portions of them with the same care that we do in cases of cancerous tumors. So that in all cases during the course of the dissection, the bistoury ought to be directed upon the exact limits or circumference of the tumor rather than in an opposite direction. We may for the same reason make use of the fingers for the purpose of detaching or even tearing out the remaining roots of the diseased ganglion, when it is deeply situated, or is found to be implicated with organs which it would be dangerous to approach with the bistoury. In delicate regions, and where the lymphatic tumors are composed of many lobes united by simple pedicles, there is no impropriety in detaching that which presents itself the first, in order afterwards to seize successively upon the others. We thus cause less destruction of parts, and more easily preserve the other tissues. Of all other tumors moreover, the lymphatic or ganglionic are those which the most frequently require a ligature to be applied to their root when we undertake their extirpation. In fact, if, after having isolated their cutaneous surface or circumference, we should have any apprehension in separating the root, that we might open into large veins or arteries which it might afterwards be difficult to reach or tie, we strangle these tumors as deep as possible by means of a ligature composed of two to five braids of thread, so as to interrupt their entire circulation in such manner as to cause their separation, or to enable us to excise them as we have said under the chapters on *Cutaneous and Erectile Tumors*.

*Dressing.*—After the extirpation of lymphatic ganglions, the *hemostatic* means and the *dressing* of the wound exact the same precautions as after all capital operations. I ought to remark however, that except in a small number of cases, immediate union does not here succeed, and that in attempting it there are more inconveniences than advantages. The wound being almost inevitably anfractuouse and constituted of irregular cavities, necessarily presents walls which it is next to impossible to bring into exact coaptation. Their tegumentary borders are closed and agglutinated with facility; but collections of blood, lymph or pus, which are soon established underneath, sooner or later compel us to re-open them, and favor the development of purulent centres, and phlegmonous erysipelas, a hundred times more formidable than a wound which has been left to discharge by second intention. Unless, therefore, the ganglion removed should be smooth (unique) and the wound exhibit great regularity, I would not advise in these cases to attempt union by the first intention. I have now (1838) performed extirpation of lymphatic tumors on near a hundred persons, and none of those who have been dressed in the manner I am about to describe, have experienced serious accidents; whilst I have almost always found phlegmasias and suppurations supervene in those in whom I have attempted the cure by immediate union. I first introduce small balls of fine lint into the bottom of all the cavities, and fill up in this manner the entire wound, which I cover over with perforated linen, then with plumasseaux, compresses and a containing bandage. When the blood flows in abundance, without there being any large arteries to tie, I pile up these balls in such manner that they may exercise a sort of compression under the bandage. I use but a small number of them on the contrary, and such as are of the most pliant kind, when there is nothing to fear in regard to hemorrhage. In proceeding in this manner the dressing is prompt and easy, and the results simple. At the end of two or three days we may, without inconvenience, remove the whole dressing down to the perforated linen. A day or two more gives time for the exudation from the wound to saturate the balls which fill it, and to allow of our removing them without any effort and without occasioning any serious pain. Each day we deposit in the wound a less quantity of these balls, and nothing is so rapid as cicatrization in these cases, so much so in fact that most of the patients are cured in the space of from fifteen days to a month. It is besides remarkable that out of near 100 patients operated upon by me for these kinds of tumors, there are up to the present time, but three who have died. I am so much the more surprised at this, because in a great number of them, the operation was long, laborious, painful and really serious. Though in some of these patients there still remained other degenerate lymphatic ganglions, though in two or three of them these new tumors continued afterwards to undergo a great enlargement, it is certain that in the great majority of cases, the cure was prompt and radical, and that the ganglions that were left have, in the greatest number of instances, ultimately retrograded, by gradually re-assuming their natural condition. Up to the present time I have performed extirpation of lymphatic tumors only in the inguinal, humeral, axillary, supra-clavicular, sub-maxillary, parotid and sterno-mastoid regions.

§ I.—*Ganglions of the Groin.*

Lymphatic tumors of the inguinal region present three modifications, which it is important should not be confounded: those which are connected with a venereal affection; those which depend upon some disease of the foot or leg; and those which belong to the class of cancers. In those cases where their origin depends upon a syphilitic infection, we must never, however ancient they may be, attempt their extirpation before having submitted the patient to the specific treatment of venereal disease. If the alteration of the lower limb which has been the cause still exists, it is also prudent when practicable, to effect the removal of this before every thing else. But if, when these precautions have been attended to, or are not practicable, the tumor is hard, of a certain volume, and has existed more than six months, after having been unavailingly attacked by topical applications and the suitable general remedies, then is the operation indicated, and it becomes proper to perform it. We should not nevertheless under these circumstances, undertake it in cases of cancerous affection, or where the chain (chapelet) of lymphatic ganglions which is prolonged into the iliac fossa was at the same time implicated in the least degree of engorgement. In cases of hypertrophy, however, or of simple degenerescence whether fungous or tuberculous, a slight degree of engorgement of the supra-inguinal ganglion would not be a formal counter-indication; as the removal of the principal tumor would have the effect in many cases to cause it to disappear. The extirpation of lymphatic tumors in the groin is one of the delicate operations of surgery. The proximity of the crural artery and vein, and their branches, and of the internal saphena vein, and the femoral nerve, will always render it difficult and formidable. The dangers it involves are nevertheless not the same in all cases. So long as it is a question only of sub-cutaneous ganglions, it is in fact possible, with a little address and anatomical knowledge to accomplish it without danger; but if the deep-seated ganglions formed the tumor, it would become necessary to renounce it, or to decide upon tying the vessels on the side of the iliac fossa, for chance alone would enable us to avoid them during the operation. When we operate for the extirpation of the lymphatic glands enveloped in the sub-cutaneous fascia, we may also find ourselves placed in two different positions. Sometimes in fact, it is the sub-inguinal ganglions that are to be extirpated, while in other patients it is the glands in the inguinal groove itself.

A. *Sub-Inguinal Tumors.*—Here the tumors have no relation with the crural vessels properly so called; they are separated from them not only by the fascia lata, but moreover by the internal border of the sartorius muscle. It is upon the line of the saphena vein that they are situated, and not in the direction of the crural artery, unless however, they should be prolonged as far as to the external orifice of the crural canal above. The patient being placed upon his back, should have the limb reversed upon its outer side and moderately flexed. An assistant fixes it in this position, while another looks to and prevents the movements of the pelvis. The surgeon placed on the outside and provided with an ordinary bistoury, divides the integuments from above downwards for the right thigh, and from below upwards for the left thigh,



as has been said above. We might in like manner place ourselves always on the right, in order that the incision might always be made from above downwards, or on the left side if we preferred performing it from below upwards for both sides. We may go with the first cut and without fear down to the sub-cutaneous layer. After having isolated each side of the wound from the corresponding parts of the tumor, we raise up the latter and give the erigne to an assistant, who should carefully follow all the movements of the operator. After having dissected it upon its sides to nearly as far as its root, the surgeon detaches it by small cuts from below upwards, and in such manner as not to wound the internal saphena vein. If, however, the situation of the tumor, or any particular circumstances should have led to the wounding of this vein, it would suffice to compress it below, and afterwards to manipulate the instrument with extensive strokes, in order to terminate the operation rapidly. Nevertheless the surgeon ought to be then aware that in this region the upper end of the veins sometimes gives rise to a pulsating (saccadée) hemorrhage, sufficiently obstinate to oblige him on his part to compress the artery, or even to apply the ligature to it. However, it rarely happens but in approaching their upper extremity, that it becomes advisable to adopt serious precautions in relation to the arterial vessels. Upon the supposition that we should have occasion here for the semilunar flap of which I have spoken, it would be better to turn its free border inwards than to the outside; in the same manner that we should divide the inner rather than the outer lip of the simple incision, if we preferred using the T incision. As to the dissection of the ganglions themselves, prudence requires that we should perform it on the inner side first, then on the outer side, then from below upwards, and to terminate at the inguinal extremity. In this manner nothing would then prevent us, should they appear to be prolonged by means of a pedicle into the crural canal and to the side of the vessels, from strangulating their root before completing their excision. If immediate union can be attempted after extirpation of lymphatic tumors, it is assuredly in the region under consideration. We should have recourse to it if the wound is regular, if the cutting instrument has sufficed for the division of all the tissues, and if after the ligatures are applied, the sanguineous exudation has a tendency to cease of itself. For this purpose the limb is straightened, after which, by means of a sufficient number of strips of adhesive plaster, we approximate and keep in contact the two lips of the wound. A perforated linen, a large gateau of lint, and some turns of the roller bandage with a spica to the groin, complete the dressing. In the contrary case, the solution of continuity is filled with small balls of lint before applying the other portions of the dressing of which I have just spoken. In either case, we afterwards place the ham and the leg upon a pillow in a moderate state of flexion.

*B. Inguinal Tumors.*—In the fold of the groin, lymphatic tumors are situated sometimes on the inner and sometimes on the outer side, or on the side towards the pubis or that of the spine of the ilium, and sometimes even on a line with the femoral artery. This difference of situation as may be imagined, renders their removal either very simple or exceedingly difficult: In a man in whom ten months before I had

extirpated a cerebroid cancer from the scrotum, I was obliged to remove a tumor of the same nature which had developed itself in a lymphatic ganglion external to the symphysis pubis, and which, having acquired the volume of the first, had extended outwardly as far as upon a line with the femoral vein. In another case I saw a purely lymphatic tumor which occupied the entire space comprised between the antero-superior spinous process of the ilium and the track of the vessels. A woman upon whom I operated in 1836 at the hospital of La Charité, had in the fold of the groin a lymphatic fungus of the size of an egg and which had been ulcerated for more than a year and was situated in the front part of the crural canal itself. Such facts are not rare, and it would be easy for me to show numerous examples of them. To perform the operation the patient should be placed and held as in the preceding case. Nor can any precise rule be given here for the direction of the incision of the integuments. If the straight incision would answer, it should be made in the direction of the fold of the groin or of the long diameter of the tumor. If the curved incision should be preferred, or become necessary to be employed, the free border of the flap must be made upon the outside and below, in which direction also the outer lip of the first incision should be divided, provided the T incision should be thought most advisable. Internal tumors should be dissected in the manner of sub-inguinal tumors, first upon the inner side, then outwardly, and finally from below upwards. The external ganglions should be dissected by a rule directly the reverse, and this in order to reserve for the last thing the most delicate stage of the operation, to wit, the isolation of the tumor at the most proximate point to the vessels. By means of these precautions we may proceed without any very great degree of danger as high up as to Poupart's ligament, or on a line with the apex of the fossa iliaca. When the diseased ganglion occupies the middle of the groin, we isolate it successively upon its two sides up and down, in order not to lay bare the pedicle until the last thing. So long as the surgeon, in order to effect this, is not obliged to divide the aponeurosis, there is nothing to fear, and should the tumor not be prolonged into the iliac canal, he may cut off its root without a previous ligature. But should he at all apprehend the extension of the pedicle of the tumor to the neighborhood of the trunk of the saphena, he will, after having reduced it to a small volume, surround it with a ligature and strangulate it with force before excising the ganglionic mass on the outer side. In the case of the woman I have just mentioned, I was obliged to lay bare the saphena vein as far as its entrance into the crural vein; but by dissecting the tumor horizontally I was enabled to isolate it without any ligature, though the artery was afterwards noticed upon the inner side of the bottom of the wound. I would not hesitate, therefore, to attack lymphatic tumors in this manner, even in the iliac fossa, should they be prolonged to that part, provided they were situated externally to the vascular trunks. Even if it were necessary I would divide the ligament of Fallopius, in order that we might by means of the finger, tear out these tumors or enucleate them in such manner as not to run any risk of wounding the principal arterial branches. But as I have already said, I would no longer hazard such an attempt if the tumors were cancerous, or the vessels surrounded as it were by the

tumors, and that there was ground for believing that there existed degenerate ganglions in the neighborhood of the lumbar region. The dressing in the groin presents some difficulties in addition to those of the preceding case. The application of adhesive straps in this place offers but a feeble resource. The tissues of this region are less homogeneous, and the disposition of the skin there is very illy calculated for primitive agglutination. Nevertheless, if the wound is uniform and in the direction of the inguinal groove, a slight flexion of the thigh may be found sufficient to maintain the two lips of the wound in coaptation. With this exception the dressing flatwise, by means of small balls of lint, the perforated linen, the gâteau of lint and the spica, appears to me to be decidedly preferable.

[Having purposely devoted a great deal of personal investigation and practice while at the Seaman's Retreat Hospital, to dressing the ugliest kind of shelving, jagged and leaden-edged, deep, sinuous, and irregular wounds left in the hollow of the groin in syphilitic cases, by burrowing abscesses and discharges succeeding to buboes and mercurial drugging, and where the wound penetrated sometimes to the depth of an inch and a half or more, and as high up as the crural arch and inguinal canal; I can testify to the pre-eminent advantages of *tight, forcible strapping* by multiplied and very long strips of adhesive plasters, decussating each other on the abdomen and down and across the thigh in every direction, so as to form a firm *stellated* support, or covering, requiring only a slight inward flexion of the thigh and persevering use of this mode to hasten granulation from the bottom, and a perfect coaptation of the edges with great rapidity and without the necessity of any auxiliary means but stimulating injections every few days this dressing is renewed. If they succeed thus with the general constitutional treatment in such desperate chronic anfractuons and *cavernous* wounds, surely they should never be neglected in the fresh wound left by extirpating lymphatic glands. T.]

## § II.—*Lymphatic Tumors of the Arm.*

Although lymphatic tumors may become developed upon the track of the cephalic vein and in the deltoid region, it is nevertheless almost exclusively upon the inner side of the arm that these tumors have been noticed. Here they may be found at all the different points of the track of the artery. Nevertheless it is at an inch or two above the inner condyle that they are most frequently met with. To extirpate them in this region the arm must be held off from the trunk, and the fore-arm extended in supination. A longitudinal incision ordinarily suffices. Commenced above and terminated below the tumor, it almost always allows of our arriving immediately upon the pedicle of the latter. It is moreover important during the dissection, that the lymphatic mass should be properly drawn out from between the lips of the wound by an assistant provided with an erigne, while another assistant should always stand ready to compress the brachial artery in the direction of the axilla. The tumor having been detached from the biceps in front and the triceps behind, may afterwards be isolated upon its deep-seated face without any very great difficulty, and without the danger of wounding any-



thing, if the surgeon is careful to carry the point of his bistoury parallel with the plane of the interior surface of the arm, and to graze with accuracy the ganglionic tissue. The ulnar nerve, the median nerve, and the brachial artery, which it quite frequently touches, would nevertheless oblige him to strangulate the pedicle of the tumor with a strong ligature, should it send off any prolongations between them, or should it appear too difficult or dangerous to complete its enucleation either with the fingers or the handle of the scalpel. Here also union of the wound by first intention, offers some prospect of success. Circular strips of adhesive plaster and a graduated compress on each side, the perforated linen, gateau of lint, square compress, and roller bandage, will always offer a facility for this, unless there should be particular difficulties in the way; we should therefore have recourse to it in the greater number of cases. If however, the slightest accident should supervene, or the least difficulty interfere, we should recur immediately to the small balls of lint and the simple dressing. The limb is then placed in semi-flexion and upon a cushion or pillow, until the stage of the primitive accidents has passed by.

### § III.—*Lymphatic Tumors of the Axilla.* •

The hollow of the axilla is a region where the lymphatic ganglions frequently become engorged and degenerate. Diseases of the breast and all those of the thoracic limb, occasion there a sympathetic action (retentissement), which makes the hollow of the axilla the locale (centre) of an infinity of tumors of different kinds, but which almost all of them, have the lymphatic ganglions for their seat. If it be true that surgeons rarely decide upon extirpating these kinds of tumors, it is in part owing to their nature, which does not allow of our always considering them as a local and independent disease, and again, because the operation is in itself of a delicate nature, and one which is in reality serious. The axillary vein and the branches which it receives in the first place expose us to a sufficiently abundant hemorrhage when we happen to wound them, and afterwards there is danger of that introduction of air which appears so frightful and so difficult to prevent in certain regions, (see Vol. I.) The artery of the same name which it may be impossible to avoid, and the nerves of the brachial plexus also constitute so many circumstances to arrest the hand of the operator. In adding to these that the manipulations of the bistoury are also necessarily restricted by the arrangement and relations of the pectoral muscles in front, those of the shoulder behind and on the outside, and of the chest on the inner side, we have a sufficient explanation of the reserve exhibited by surgeons in this matter. Having, however, frequently encountered lymphatic tumors of the axilla which nothing could disperse, and which were gradually conducting the patients to the tomb, I have thought nevertheless that I could surmount those objections, and now extirpate tumors of the axilla, after the same indications as those for the inguinal region; it is in fact an operation which, since the year 1837, I have performed a great number of times, and under circumstances greatly diversified. From whence I have acquired the conviction that this operation, as I am about to show, is in fact much more frightful [effrayante, i. e., in ap-

pearance, T.] than in reality dangerous. Many of the patients upon whom I have performed it, had tumors of an enormous volume, which raised up the pectoralis major, surrounded the brachial plexus and vessels, or were prolonged at their upper part as high up as the supra-clavicular depression. Out of an aggregate of about 25 examples which I could enumerate at the present time, there have been only two cases of deaths; one of which was a young woman upon whom I operated in 1828 at the clinique of M. Bougon. The tumor, which was of the size of the head of an adult, completely filled the hollow of the axilla, ascended as high up as above the clavicle, and required an extremely extensive dissection. The patient, after having exhibited some encouraging indications of a cure, was seized with a pleuritic effusion and died at the end of three weeks. The second patient was a woman nearly sixty years of age. All the ganglions of the axilla had to be torn out, one after the other; an enormous cavity was the result, which, however, was in great part filled up when a diffused (ambulant) erysipelas supervened and carried the patient off. A third patient who had undergone a similar dissection, died at the expiration of two months, in consequence of accidents disconnected with the operation. All the others operated upon recovered, the most of them very rapidly, that is to say, within the space of fifteen days to a month or six weeks. An inconvenience which retards the cure in this operation, where we are obliged to liberate the part from its ganglions, is the interruption to the circulation of the lymph, and a tendency to engorgements and infiltration of the hand and fore-arm. There may also result from it so great a contraction of the hollow of the axilla, that the movements of the shoulder and the separation of the arm, especially from the trunk, may be greatly obstructed. The manner of performing the operation, though varying according to the size and precise situation of the tumor, is, however, reduced to two processes: one which consists in penetrating into the hollow of the axilla without dividing the muscles; the other in dividing at first through the lower border of the pectoralis major muscle, or even the whole thickness of the two pectoral muscles as high up as to the neighborhood of the clavicle.

A. *By the hollow of the axilla.*—It rarely happens that the incision at the hollow of the axilla does not answer for the operation in question; the preferable position of the patient being upon a bed, rather than seated on a chair. One assistant is to draw the arm towards him, while another stands ready to compress the subclavian artery upon the first rib. The surgeon, provided with a straight bistoury, makes his first incision which comprises the entire length of the great diameter of the hollow of the axilla, and extends from the upper part of the arm to below the tumor or even to the side of the chest. Upon the supposition that this first incision will alone answer for the whole dissection, it is better to place it rather behind than too near the anterior border of the axilla; in the contrary case, should it become advisable to divide its posterior border, it is more proper to place it altogether in front. Having thus divided the integuments, sub-cutaneous fascia and aponeurosis, we introduce a finger into the wound to serve as a guide for the simple or double erigne, which is immediately to hook up the mass to be removed. The surgeon then dissects the

tumor in front, and behind, and on the inner side, and finally from below upwards, in proportion as the assistant draws upon it in the direction required. Having arrived into the hollow of the axilla itself and upon the side of the arm, I have often succeeded in detaching it completely by means of short strokes with the bistoury, while the forefinger of the left hand directed backwards and deep, by raising up the brachial plexus or the vessels, acted as a director. This stage of the operation, which sometimes enables us to dissect the important organs in the hollow of the axilla in the same way as for an anatomical preparation, is too delicate and hazardous to permit me to lay down a general precept. The best mode then is to tear out gently, though with force and by means of the finger, all the lobules of the tumor which appear to be interspersed among the vessels or nerves, or which are prolonged to too great an extent in the direction of the clavicle and the regions of the neck. Should the engorgement of the ganglions be prolonged only by a pedicle above and to the outside, it would be still more easy to surround it with a triple thread and to strangulate it forcibly, in order to excise the whole gland immediately below it. By means of these precautions we remove with promptitude and facility, tumors which do not exceed the size of an egg. We also extirpate without danger or any very great difficulty, those which are too much enlarged and which present themselves under the aspect of bunches of grapes when occupying principally the thoracic wall of the axilla. There are no real difficulties or dangers therefore but for those tumors which rest against the root of the arm or articulation of the shoulder, and for those which are prolonged to above the clavicle. Ordinarily during the entire operation there are but a small number of arteries opened. These are the branches of the external mammary artery, those of the anterior (anterieurs) thoracic arteries, of the common scapular artery, and rarely the internal circumflex artery. We might apply the ligature to them in proportion as they are divided, but there is but little inconvenience in causing them to be covered temporarily by the extremity of a finger, and in waiting until the end of the operation before tying or twisting them. I have no need of remarking that if unfortunately the axillary artery should have been wounded, as in the case mentioned by M. Wolf, (*Graefe und Walther Journal*, t. VII., p. 261.) it would also become necessary to apply the ligature instantly. The hemorrhage at this time, which is most troublesome, is almost always furnished by the veins; so much the more so because in the axilla as in the groin, the venous reflux which might under these circumstances extend back even to the heart, is not yet entirely annihilated. This kind of hemorrhage moreover which we first arrest with the finger, afterwards readily yields to tamponing and compression. The proof of this I have from having seen the axillary vein itself opened in an operation of this kind. I lay it down as a principle not to attempt immediate reunion in these cases. For they are of those in which the extirpation of the lymphatic tumors leaves a cavity too anfractuous and a wound too irregular to make it possible to hope for primitive agglutination. I place therefore small balls of soft lint upon all the points of the traumatic cavity, until it is well filled with them and that they produce a certain degree of compression, should it seem requi-



site to adopt any precautions against the flow of blood. A perforated linen, a gâteau of lint, and one of the ordinary bandages for the axilla, serve to complete and to sustain the dressing.

B. *In front of the axilla.*—If owing to its absolute volume or primitive situation it should become impossible to enucleate the tumor by the hollow of the axilla; if, as I have seen it in attendance with MM. A. Bérard and J. Cloquet, in a young subject aged ten years, the tumor should appear to be situated between the two pectoral muscles, or seem agglutinated as it were upon their posterior surface, it would be better to divide the anterior wall of the axillary region than to operate in the manner I have just described. In a young girl whom I have spoken of farther back, and whom I operated upon in 1828, it became necessary to divide the tissues obliquely from above downwards and from before backwards, from the inner third of the clavicle to the lower border of the latissimus dorsi muscle. Another incision parallel to the posterior border of the axilla thus circumscribed four flaps, two smaller which I reversed downwards and backwards, and two very large which I dissected, reversing one of them upon the side of the sternum, and the other upon the shoulder. These two last, comprising the entire thickness of the pectoral muscles, enabled me to detach little by little from the front part and side of the chest, the totality of the tumor, which it afterwards became necessary to isolate behind from the sub-scapularis muscle, from the border of the clavicle above and in front, and from the whole brachial plexus on the outside, and finally to extirpate it from the supra-clavicular depression, where one of its roots of a sufficiently large size had been prolonged. We might here easily avoid the necessity of posterior flaps by substituting the T for the crucial incision. The horizontal branch of the T being placed behind and parallel to the posterior border of the axilla, would put it in our power to fall upon it with an incision which would be vertical or more or less oblique, and which should set out from the front part of the clavicle. The two large triangular flaps circumscribed in this manner, would give every facility desirable, and would accommodate themselves in a remarkable manner to every possible mode of dressing. If the tumor should be more projecting in front than above, it would be practicable to lay it bare with still greater ease by means of the semilunar flap of which I have so frequently spoken. The free border of the half-moon in this case might be turned downwards towards the axilla, inwards towards the sternum, or outwards towards the arm, according to the form of the tumor or the particular indications. It would be necessary for the same reason to cut it out upon a curve of greater or less depth, and more or less elongated. This flap, being raised up upon its base, would allow as readily as the others of dissecting out the tumor up to its termination, and would be attended with the advantage of reducing the operation in fact to the condition of a simple incision. The section of the fleshy fibres which might here interpose, presents nothing in itself serious. What I have said of the division of the tendons and muscles (see Vol. I.) is sufficient to show that misapprehension had prevailed in this matter. If the operation, therefore, by this division would be made more simple and less dangerous, we ought not to hesitate; we should operate also

in front rather than at the hollow of the axilla. The dressing after extirpation of tumors of the axilla by this process, enables us better than the other to undertake immediate union. Whatever may be the form of the flaps, they should be brought together and approximated in such manner as to leave a void only at the depending point of the axillary cavity. They are to be consequently replaced in such a way as to reconstruct, as completely as possible, the anterior wall of the axilla. But I would recommend to leave a meche or tent, or some rouleaux of lint between the lips of the lower part of the wound, so as to provide at that place for the egress of the discharges. This mode of reunion is effected at the axilla as every where else, by means of simple strips of adhesive plaster, aided by position or the suture. I ought to remark before concluding, that in operating at the hollow of the axilla, should the simple incision not answer, we might equally substitute with advantage for the T or crucial incision, that of the semilunar, taking care in that case to turn its free border backwards and outwards. In whatever way the operation and dressing may have been performed, the arm should be kept immovable and slightly raised up towards the shoulder. After the first dressings, it is important, however little the purulent matters tend to stagnate, to open a passage for them. It is at this period therefore that we must prevent the too rapid union of the lower portion of the wound, separate the arm a little from the trunk, substitute emollient cataplasms for the lint, or even have recourse to emollient and detergent injections into the traumatic cavity. Acting upon these principles I have frequently removed tumors from the hollow of the axilla, which many practitioners had refused to extirpate. (Dufresse, *Journ. Hebdom.* 1835, t. IV., p. 276.) The tumor in the form of a bunch of grapes, which almost equalled the size of an adult head, and which M. Goyrand (*Lancette Franc.*, t. II., p. 256) successfully removed under the impression he was operating for a scirrhus, was probably a lymphatic tumor. M. Lallemand (*Lafosse, Clin. de l'hôpital Saint Eloi*, p. 4) who employed the suture to unite the wound, and who also supposed he had extirpated a cancerous tumor, likewise as it appears to me removed only degenerate lymphatic ganglions. Though no one moreover up to the present time had laid down precise rules in respect to the operative manual in the extirpation of tumors of the axilla, it is nevertheless true that some surgeons occasionally had recourse to this operation. We already find even in F. de Hilden the rule to cut down upon them, and to draw them towards us and tie their pedicle deep down, before completely detaching them from the body. It would be abusing the patience of the reader to say now that we should proceed in the same manner for scirrhus, colloid, encephaloid, melanotic, fibrous, fungous, or any other form of tumors other than those that are lymphatic. The only point which it is important not to lose sight of under such circumstances, is this, that we should not undertake the extirpation of *malignant* tumors, if the least particle of them is to escape from the action of the bistoury or the ligature in mass; while tumors purely ganglionic or tuberculous, may be extirpated with considerable chances of success, even though we are forced to abandon some of the engorged ganglions in the axilla or above it.

§ IV.—*Lymphatic Tumors of the Neck.*

There exists in the neck so great a number of lymphatic ganglions, and these ganglions are distributed upon so many different points, that it is scarcely possible to study their extirpation separately in all the situations in which they sometimes give rise to the formation of abnormal tumors. It has happened to me on two or three occasions to extirpate them where they were situated behind the sterno-cleido-mastoid muscle, and seemed to repose upon the outer side of the trapezius. In that position we may lay them bare freely by a simple incision, directed from above downwards or a little obliquely. As in this region there is no important organ to avoid, we may, after the incision of the integuments is made, and the tumor is properly secured with the hook, proceed with free and rapid strokes of the bistoury. From the natural tension of the parts rendering it almost impossible to keep in perfect contact the walls of the cavity which results from this operation, we have the reason why immediate reunion scarcely ever takes place, and that it is more prudent in fact to dress flatwise and with small balls of lint, rather than by the exact approximation of the parts. If, as I have seen in two or three cases, the tumor, which was in all situated behind the sterno-mastoid muscle, should occupy the upper third of the neck or the neighborhood of the occipito-mastoid region, we might proceed otherwise, and treat the division of the integuments as an ordinary simple wound. Between the os hyoides and thyroid cartilage, where lymphatic tumors of the neck are sometimes developed; between the sternum and the thyroid gland, where they have also been met with in some patients, they should be treated as will be mentioned in the article upon operations which are performed upon the neck. But it is necessary to consider the extirpation of lymphatic tumors separately, in the parotid, sub-maxillary, carotid and supra-clavicular regions.

A. *Parotid Tumors.*—Having to treat elsewhere of the removal of the parotid itself, when this gland is degenerated, I could only repeat here the details into which I shall then be obliged to enter,—(see *Extirpation of the Parotid*, infra.) I will say only in anticipation that those tumors formed by the parotid gland of which so much has been said, have all of them, or almost all of them, for their basis or point of departure the lymphatic ganglions properly so called. It is from having frequently ascertained the truth of this position that I take the liberty at the present time to affirm it positively.

B. *Sub-maxillary Tumors.*—The sub-maxillary tumors that are most common, are observed in the mylo-hyoid space; but they are met with also directly under the chin, quite frequently under the angle of the jaw, and sometimes also upon the external face of this bone in front of the masseter muscle. In a young girl aged ten years, who had one of the size of a large nut under the chin, I made an incision, which being carried from the symphysis of the jaw to the level of the os hyoides, while the head of the child was held back by an assistant, enabled me to hook fast, dissect out and completely extirpate the tumor with ease. The wound which was united by first intention by means of a band of adhesive plaster passed under the jaw in the



form of a bridle, was completely closed up in less than fifteen days. In another patient who had one of them on each side the median line, it became necessary to make two such incisions. As these tumors were in part softened and as they left quite an irregular cavity, I deemed it advisable to dress them with small balls of lint and to treat them by secondary reunion; the cure nevertheless was completed at the end of three weeks. The lymphatic tumors which at this part are sometimes sub-cutaneous, at least situated in front of the muscles, are not approached by any large sized artery. The sub-mental is the only one that may be wounded and require a ligature. Nevertheless there sometimes exudes from the wound a sufficiently considerable amount of blood to oblige us to give the preference to tamponing to dressing simply with adhesive plaster. Under the angle of the jaw the ganglions may acquire the size of a nut, egg or fist. Being in that part situated outside of the digastric muscle, and sub-maxillary gland, and in front of the sterno-mastoid muscle, they approach sufficiently near the internal jugular and the carotid arteries to create some little apprehension in those who should desire to attempt their extirpation. Nevertheless I have frequently removed them and always found that the operation was simple and sufficiently easy. For that purpose, the patient being inclined a little towards the sound side, and having the chin slightly raised up, should be kept in this position by assistants, who should at the same time depress his shoulder upon the diseased side. Should the tumor be of medium size, I lay it bare by means of a curved incision, modelled in some measure upon the curvature of the sub-maxillary region. If the lymphatic mass is of a certain volume, I give to this incision a very decided semilunar form, in order to obtain a flap which may be raised upon the side of the jaw from below upwards and from behind forwards. Having then seized the tumor with a hook, which an assistant is charged with making traction upon in the proper direction, I proceed to the dissection. The finger holds apart and stretches the lamellæ in proportion as the instrument divides them, and when we reach near the deep-seated parts, completes the enucleation should there be any organ there which ought not to be exposed to the point of the bistoury. Whether the wound forms a semilunar flap or a simple curved incision, it ought not to be completely closed except in extremely simple cases. In the aggregate we are exposed to fewer inconveniences when we treat it by gentle tamponing, than when we endeavor to unite by first intention. The tumors on the outer side of the jaw however are sufficiently rare. I have removed some which were situated exactly upon the track of the facial artery. There can be no positive rule for the direction of the incisions in such cases, and the great diameter of the tumor must serve as our guide for their location. We must be prepared moreover to wound the external maxillary artery, inasmuch as it is often enveloped as it were by the ganglions which we have to extirpate; but this vessel is not of sufficient importance to create the least uneasiness, and the surgeon has only need of recollecting that it is generally advisable to tie or twist both its lower and upper end, in consequence of the reflux which takes place from the coronary arteries or the angular artery. The wound here being on a fixed plane might be closed by primitive agglutination, if it

were found in other respects under conditions which would authorize our undertaking this kind of union with reasonable chances of success.

C. *Mylo-Hyoid Tumors*.—The triangular space bounded on the inner side by the mylo-hyoid or the hypo-glossus muscle, outwards and upwards by the inner face of the jaw, and outwards and downwards by the supra-hyoid aponeurosis and the platysma myoides muscle, and in which space is situated the sub-maxillary gland, also includes a variable number of lymphatic ganglions, which frequently become diseased, and sometimes enlarge to such extent as to acquire the volume of an egg or greater. These tumors becoming developed in consequence of diseases of the face or anterior region of the cranium, or of the interior of the mouth or of the gums, frequently exist under the character of a local affection in persons, who in other respects, are in the enjoyment of good health, and who have no other kind of lymphatic engorgement. It is in such cases that I have most frequently practised extirpation of the glands of the neck, and where the operation succeeds the best. In addition to the examples which I have elsewhere published, I could at the present time add a great number of others. The tumors of which I speak are globulous, generally ovoid, movable, hard or elastic, and exceedingly prominent below the jaw. In pressing them at the same time through the mouth and at the supra-hyoid region, one would suppose that they were isolated (*à nu*) under the mucous membrane and under the skin. But this appearance should not deceive us. Lymphatic tumors of the sub-maxillary region, are necessarily sub-aponeurotic, and the surgeon must expect to search deeply for them, if he expects to remove every part that is diseased. As for the rest, provided their surface has not undergone any degeneration, is not ulcerated, nor has contracted any unnatural adhesion with the surrounding tissues, the removal of the larger sized ones is not essentially more difficult or dangerous than that of the smaller.

I. The *operative process*, moreover, is sufficiently simple; and the incision of the integuments may be performed in three ways. 1. An incision parallel to the lower border of the jaw or to the great diameter of the tumor, ordinarily suffices; only that it is advisable to place it sufficiently low down, in order that after the operation it may not be drawn towards the base of the bone. The wound being thus reduced to a simple slit, leaves only a linear cicatrix, which is naturally concealed under the jaw, and is scarcely perceptible.

II. If the straight incision should not give sufficient freedom, as happens when the tumor exceeds in volume a large sized pullet's egg, a vertical incision upon the lower lip of the first wound, would procure a division in T, with two lower flaps, which should be dissected and reversed, one to the front and the other backwards.

III. In this case I would still give the preference to the curved incision and semilunar flap, over the T incision. This flap, raised up from the neighborhood of the os hyoides to the face, would enable us to lay bare the entire cutaneous surface of the tumor, and would afterwards fall by its own weight over the cavity of the wound. In whatever way we proceed, the patient being placed upon the bed and inclined as has been described above, should have the chin raised and

the head thrown backward. The incision of the integuments should be made boldly and as far as to the most projecting point of the tumor. Its anterior angle may be prolonged without apprehension of wounding any important artery. But posteriorly it is not the same; there it may be possible that the facial vein, or even the external maxillary vein has been raised up by the lymphatic tumor and rendered more superficial than usual. Most frequently, however, these vessels are situated rather behind and on the inner side of the posterior extremity of the tumor. It is sufficient to say that in these cases, the dissection of the parts should commence from above, or from below, or at the anterior half of the degenerated ganglions. Being secured and drawn forwards and outwards by means of an erigne; these tumors are afterwards disengaged from the bottom of the mylohyoid fossa by means of the finger or the handle of the scalpel, as much as by the cuts of the bistoury. If the facial artery should, as frequently happens, be wounded, there is no cause to be greatly alarmed. The ligature is to be applied immediately, or what is as well, it is to be temporarily closed by the finger of an assistant. Were we not prepared for this, we might in fact, in a great number of instances, suppose that we had opened it, when it is the secondary branches only which enter into the tumor at the apex of the ganglions, that have been divided. The disease sometimes produces such enlargement in these branches that we not unfrequently find them to have acquired the dimensions of a crow's quill, and throwing out blood with violence at the moment that they are divided by the bistoury. We may while dissecting out these tumors be compelled to penetrate as far posteriorly as the sides of the larynx and in front of the carotid arteries. I have frequently seen pulsating naked before the eyes of the operator, and at the bottom of the cavity previously occupied by the tumor, the lingual artery on the inner side, the internal carotid behind, and the external maxillary without. This cavity which at first has something frightful in appearance and which could easily contain the fist, may be prolonged also as far as the median line in front and the os hyoides below. M. P. Eve (*Southern Medical and Surgical Journal*, January, 1838; and *Gaz. Med.*, 1838, p. 17) penetrated in this manner as far as the outer side of the tonsil to remove a tumor of half a pound in weight, and cured his patient. I assisted M. Vidal in a young man in whom he removed three degenerated ganglions which occupied one entire side of the supra-hyoid region. Unless the tumor be uniform and small in size we must not attempt to close this cavity by first intention. Tamponing and the mode by second intention, offer an infinite deal more of security and without materially retarding the cure. It is to be recollected, only that after the first eight or ten days, that is, when the balls of lint become no longer of any use, the upper lip of the wound, drawn upon as it is by the border of the jaw, has such tendency to be raised up towards the face, as to require some preventions. It is then that a strip of adhesive plaster, placed on the outside of and along the lower border of the jaw, serves to retain it and crowd it downwards and prevent its retroversion (*renversement*). This strip would become still more advisable, if in place of the usual incision, we had employed the semilunar flap to lay bare the tumor



By this kind of primitive secondary union we are protected from erysipelas and purulent collections, while we produce notwithstanding, in the space of fifteen days to a month, a perfect cure, with a cicatrix nearly linear. This mode of extirpation, for which no person had given the process when I pointed it out in the year 1825, has now been performed a great number of times successfully by M. Bégin at Strasbourg, (*Malle Arch. Méd. de Strasbourg*, 1836,) by M. Sédillot, (*La Presse Méd.*, t. I., p. 139,) and by M. H. Larrey at the Hospital of Val-de-Grâce. For myself, there is not a year, that I have not had recourse to it, on from ten to fifteen patients; and I have not seen up to the present time any operation whose consequences are less serious. Every thing goes to show that in this region, the introduction of air into the veins is not to be apprehended, notwithstanding some facts which have been related in favor of a contrary opinion. Unless therefore there should be some particular complication or counter-indication connected with the general constitution of the patient, the extirpation of lymphatic tumors from the sub-maxillary region, should be recognized in practice as a systematized operation of surgery.

*D. Tumors of the Carotid Region.*—After the mylo-hyoid depression and the carotid region, the sterno-carotid groove is that on which lymphatic tumors are the most frequently met with. The chain of ganglions which occupy this groove, is composed of such numerous glandules (grains) that they are noticed on every part of its length from the supra-sternal fossa to the angle of the jaw. They are distributed, moreover, in such a manner, that some repose directly upon the anterior surface of the vessels, while others lie entirely concealed, either by the internal surface or by the posterior border of the sterno-cleido-mastoid muscle. I have, however, never found them to be absolutely superficial, though I have sometimes met with them all around the carotid artery or jugular vein, while others were at the same time prolonged under the posterior surface of the pharynx or œsophagus. If in this region the tumors are numerous, deep-seated, and but little prominent, or should raise up the sterno-mastoid muscle, in place of projecting towards the side of the neck or larynx, it is better not to meddle with them, or to attack them only with general remedies and local applications. If, on the contrary, they present themselves under the form of one or more movable lumps, (bosselures,) making a projection between the sterno-mastoid muscle and the middle of the neck, and if their totality constitutes a mass, independent of the thyroid body, the carotid artery, or jugular vein, without having any prolongation in the direction of the chest, it is allowable and practicable to undertake their extirpation. Upon the supposition that the tumor situated transversely, and strangulated by the sterno-mastoid muscle should be bilobate, in such manner as to present one of its halves posteriorly, and the other in front, there would still be ground to attempt its removal, should the uniting bridle, in other respects, be so thin as to allow of our avoiding the neighboring vessels and nerves. To perform the operation, the patient is to be placed upon his back, taking care that his head is raised sufficiently high upwards. In this position the sterno-mastoid muscle being stretched and thrown backwards, pushes the tumor forward, and in this manner

renders it more superficial, while at the same time it gives it a greater degree of fixity. The surgeon making his incision from above downwards, divides the integuments to an extent which should exceed the limits of the tumor by nearly an inch. As soon as the front part of the tumor is laid bare, he detaches the lips of the wound upon the outer and then upon the inner side. It is at this moment that he hooks his erigne into it, in order that an assistant may secure it, and hold it aside while the dissection is being proceeded with. This dissection has nothing about it particularly difficult until we arrive near the bottom of the carotid region; but setting out from there, the finger should always precede the point of the bistoury, and no lamella of tissue ought to be cut without having been previously stretched by means of the forefinger. By inclining the extremity of the instrument towards the ganglionic surface, we avoid with certainty all the large vessels which are situated behind. I have, moreover by adopting the mode of enucleation, several times succeeded in detaching some more deeply situated lobules, which were entangled behind the jugular vein, or carotid artery, and sometimes between those two vessels. It is, moreover, a matter of little importance, whether the deep-seated surface of the tumor should be isolated from above downwards, or from below upwards. We must be prepared to find by this operation, as has happened to me in quite a great number of cases, that we have extensively denuded the carotid artery, the internal jugular vein, the pneumo-gastric nerve, and the great sympathetic. It suffices to remark that these organs might be interfered with, and that we must be on our guard against wounding them. [See case in our Vol. II, under the head of the *nerves*, in which the pneumo-gastric imbedded in a tumor recently removed by Dr. McClellan, of Philadelphia, had to be completely divided, which, however, did not interfere with the restoration of the patient. T.] It was in a case of this kind that M. Foulloy (Ansiaux, *Clin. Chir.*, p. 238, 2d edit.) was compelled to tie the carotid artery. There is every reason to believe also, that the tumor successfully extirpated by M. Voisin, (*Gaz. Med.*, 1835, p. 447,) and which obliged him to dissect upon the carotid, was one of the class of those of which I am speaking. We may conceive also, that an opening into the internal jugular vein, would in this part endanger to a greater degree than in most other regions of the body, the introduction of air into the heart, and the fearful accidents which are the consequence of it. In a young man in whom I had removed one of these tumors on the right side of the larynx, there was heard at the moment of my dividing one of the anterior veins of this region, near the jugular, a hissing and gurgling sound, which at first gave me great uneasiness, the more so from the patient uttering a piercing cry that he was dead! There followed, however, no serious symptom, and the consequences of the operation were exceedingly simple. I have already stated, (see Vol. I.) that a woman in whom I had been obliged to penetrate as far as to the posterior surface of the pharynx, was seized to an extreme degree with the symptoms which indicate the entrance of air into the veins, at the moment when I had wounded the upper part of the internal jugular. Without asserting that these facts are very conclusive in respect to the

entrance of air into the venous system; it is proper, nevertheless, that we should not forget them, and that we should reflect upon the circumstances which may produce them, when we have decided upon the extirpation of lymphatic tumors in the carotid region. When some of the lobules of the tumor are situated at, and project towards the posterior border of the sterno-mastoid muscle, it is not uncommon to see them have a tendency to move forwards, and conceal themselves to a certain extent under the muscle, in proportion as we extirpate the anterior lobes. Their removal also, greatly embarrasses the operation, and admits of the question, whether it would not be more advisable to attack them separately, by means of an incision, independent of the first, and before commencing the other part of the operation. Having in one case adopted this plan, I found that the rest of the tumor, thus liberated from all kind of adhesion posteriorly, advanced freely forward, and yielded readily to the tractions that it was afterwards necessary to make upon it. In case of still greater complication, as for example, where besides these two lobes, anterior or posterior, the tumor should be exceedingly thick at its neck, I would not hesitate in order to lay it bare, to divide the sterno-mastoid muscle, and in such manner as to transform the entire wound into a large T incision, whose stem should be placed transversely. Here also, more than in the sub-maxillary region, the dressing by second intention should have the preference over immediate reunion. The lamellar character of the tissues, the natural and unavoidable mobility of many of them, and the great number, or the importance of the vessels which have suffered, do not allow in such cases of our counting upon a free primitive agglutination; and the danger of purulent abscesses in the direction of the chest, either above or below, is too formidable to incur this risk by attempting to shut up the wound by first intention.

E. *Supra-Clavicular Tumors*.—The hollow, or species of cavity which is noticed above the clavicle, also contains lymphatic glands, whose degeneration is not uncommon, and which come under the same considerations of pathology, therapeutics and operative surgery, as the preceding. Nor should I, as they are surrounded with numerous or important vessels and nerves, any more recommend their extirpation to be undertaken unless in a case of necessity; the more so, as it is often difficult to ascertain in the beginning, whether they are continuous or not, by chains of the same nature as far as the axilla, or in the direction of the chest. A young lady who had one of these tumors upon the front, and outside of the scalenus anticus muscle, was desirous of getting rid of it. Before being enabled to complete its removal, the surgeon, a celebrated practitioner at Paris, found that it made a prolongation inwards, and that there was a similar one in front of the carotid vessels. In his attempt to extirpate this last, he opened extensively into the internal jugular vein, near its junction with the subclavian. A copious hemorrhage followed: the operation, nevertheless, was finished, but symptoms of purulent infection, or phlebitis, soon made their appearance, and the unfortunate lady perished on the eighth or ninth day, causing to her afflicted relative who was a physician, and greatly attached to her, the most poignant regrets. I would, therefore, not extirpate lymphatic tumors in the



supra-clavicular region, unless they were perfectly movable, isolated, and without any ramification towards the anterior region of the neck, or towards the axilla or thorax. Another reason which would prevent me from interfering with them except under these circumstances, is this, that if the introduction of air into the veins is really dangerous any where, it ought to be so in the supra-clavicular region more than any where else. Up to the present time, I have performed this operation only upon five patients. In three of them the tumor, which did not exceed in volume a large nut or small egg, was so well isolated and movable that there was no serious difficulty to be surmounted. The two others had each a ganglionic mass, which was prolonged as far as the brachial plexus, and subclavian vessels. This dissection was tedious, but no accident supervened, and the cure was completely established. The patient should have the chin slightly raised up, the head inclined towards the sound side, and turned back, and the shoulder of the diseased side depressed, and also directed backwards. The surgeon placed on the same side, makes an incision parallel to the clavicle if the tumor exceeds the volume of an egg; and in the contrary case, parallel to the axis of the body. In whatever way made, this incision should be of sufficient extent not to embarrass the consecutive steps of the operation. Supposing after the first incision we should be under the necessity of making another, we would then freely divide the upper lip of the wound in the first case, and the outer or posterior lip in the other. Perhaps, also, it would be more advisable, in lieu of these different modifications of the ordinary incision, to substitute a large semilunar flap, taking care to turn its free border outwards and downwards. The integuments being now held aside or turned back, the surgeon seizes the tumor with the erigne, and hands it over to an intelligent assistant, that he may raise up or incline the diseased mass according as it may be required during the remainder of the operation. The dissection is also to be performed after the same rules as in the preceding regions. It is better in commencing, to do this from above, then outwardly, than to begin on its inner border or inferior portion, since the internal jugular or subclavian vein lies on one or the other side of it. Having arrived at its deep-seated surface, we should isolate it after the same rules (*dans le même sens*), and here still more than in any other region, would there be occasion for strangulating its root completely below it, if it should appear to be too hazardous to detach it up to its termination by means of the point of the bistoury, and that the finger would not suffice for enucleating it. This operation, which is ordinarily very painful, in consequence of the numerous branches of the cervical plexus, which are dispersed throughout the whole extent of the supra-clavicular region, compels us also, in most cases, to divide the external jugular vein; but this vessel is of too little importance to make us hesitate about sacrificing it. I would not hesitate, then, to divide it in the beginning, and afterwards to tie its upper end and even its lower, if I thought it could cause the least inconvenience. We should have to respect, also, and to tie them should they be divided, the transverse cervical artery, the supra-scapular, the ascending cervical, and even the inferior thyroid. As to the dressing, I would regard it as exceedingly imprudent to wish to run the

risk of union by the first intention. In whatever way we may proceed, the internal surface of the flaps or lips of the wound cannot be applied with the required accuracy against the bottom of the solution of continuity. Suppuration being thus rendered unavoidable, and having no issue, would expose to the risk of purulent abscesses and diffused inflammations, of which it would be difficult to arrest the progress or avert the danger. The flat dressing by means of pliant balls of lint, perforated linen and plumasseaux, secures us from these apprehensions, and does not perceptibly retard the definitive cicatrization of the wound.

Can it be necessary now to add, that lymphatic tumors may be developed everywhere, where there naturally exist ganglions of the same name, and that everywhere also it would be advisable to attack them by conforming ourselves to the rules established in the preceding paragraphs? Until practice shall have acquired a certain extension on this point, it would be useless, as I consider, after having laid down the general rules, to detain ourselves with the projection (supposition) and description of special processes.

[*Lymphatic Tumors* or Lymphatic Cysts, those in fact called by the French *cold abscesses* (abcès froids), have been treated successfully by Dr. G. Capelletti, of Trieste, (*Giornale per servire, &c.*, January, 1842; *Arch. Gén. de Paris*, 4e ser., t. III., p. 346-347.) by means of injections of nitrate of silver (2 to 3 grammes of the nitrate to 500 grammes of water); injecting through punctures first made in various places by the trochar in order first to evacuate the contents of the tumor. The tumor is to be filled with the injection, and the action of the latter aided by uniform and continued pressure.

One of the most remarkable and mysterious cases of a *general hypertrophied condition of all the lymphatic glands* on the external sub-cutaneous regions of the body in an adult woman from one of the provinces of France, aged 38 and otherwise perfectly healthy, occurred to the excellent author of this work, M. Velpeau, in his own service at the Hospital of *La Charité*, at Paris, during the year 1845. These enlarged glands in the only account of them we have yet met with (*Annales de Thérapeutique*, Paris, April, 1845, in Cornack's *Lon. & Edinb. Month. Journ.*, June, 1845, p. 459.) are, it is stated, found in this woman in masses, as it were, or strung in chaplets varying from the size of an almond to a hen's egg, in every region externally where such glands exist, viz.: in the axilla, groins, neck, elbows, legs and trunk. They roll under the finger, are without pain or change of color on their surface. They appeared almost two years before without any appreciable cause. The woman had previously enjoyed excellent health; she is even now robust and suffers nowhere, except that the tongue is a little white, and the digestive organs are occasionally out of order. She says she has lost flesh, but she is still rather stout; the skin has a slightly yellowish tint, but not approaching to icterus; she has perspired copiously through the night for some time past. No one of her family, so far as she knows, has been affected in a similar way, and none of the inhabitants of the country where she resides have any thing similar. Her place of residence is well aired, and from her occupation she

passed most of her time in the open fields. M. Velpeau retained her in his ward as a subject of study; she was put on the extract of walnuts for nearly two months, but no favorable change occurred; the health of the patient seeming rather to decline. This case seems to call in question the pathological accuracy of the opinion that the enlargement of the sub-cutaneous glands is necessarily connected with a scrofulous temperament, and the evolution of which temperament, so far as these glands are implicated, generally takes place in the early period of childhood. In this woman nothing is found but general hypertrophy of the glands; the serous membranes are in a good state, the osseous system exhibits no alteration, and there are no knotty cords in the course of the lymphatic vessels, as is the case in some kinds of erysipelas. It may be termed a sort of general *ganglionitis*; but it does not follow that it is true scrofula, since there are none of its constitutional symptoms. Nor is there any thing of cancerin this case, though this affection is by some thought to have its origin in chronic lymphitis. T.]

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## CHAPTER IV.

### NEUROMATIC TUMORS (*Neuromes*).

Pathologists have frequently mentioned small tumors, usually sub-cutaneous, the distinguishing feature of which is that of causing from time to time, and upon the slightest occasion, painful irradiations excessively acute, which yield to no remedy and are a source of torment to the patients. These tumors, which many persons have located in the nerves, with which however they must be disconnected, if Dupuytren and M. Wood (*Trans. Med. Chir. of Edinburgh*, vol. III., p. 317), which M. Jaumes (*Thèse* No. 266, Paris, 1828), ranges among cancers, that Boyer was desirous of considering as scirrhus, which are bodies *sui generis*, according to some others, and upon which MM. Arronshon (*Thèse*, Strasbourg, 1822), Clerambeault (*Obs. de Méd et de Chir.*, 1829), Wood, Descot (*Affections locales des nerfs*, 1825, p. 208 to p. 286), and Alexandre (*De tumor nerv.*, etc., Leyden, 1810), have published interesting observations, are much more common than would be imagined according to classical authors. Not having to decide in this place what may be their real character, I will confine myself to saying that for the most part they have been found on the track or in the substance itself of the nervous cords, and that they have sometimes presented themselves to me with the characters of tuberculous masses, and at others under the aspect of tumors that were truly scirrhus or encephaloid in the crude state; while in other cases it would have been utterly impossible for me to have compared them to any other morbid production or degenerate tissue. It is incorrect to assert with Descot (*Op. cit.*, p. 208,) that their size varies from that of a grain of wheat to that of a bean; for I have met with some whose dimensions exceeded that of the fist, and we shall see farther on that other observers



have met with similar examples. It would be more correct to say that their volume varies from that of a grain of wheat to that of the head of a new-born infant. Descot, in his work (*Ibid.* p. 209,) which was prepared in great part under the dictation of Bécлар, commits another error in saying that these tumors are scarcely ever multiplied. M. Wood, in fact, speaks of a patient who had three of them. Siebold had two of them above the instep, and I counted *nineteen* upon the same patient at the hospital of La Charité, in 1836. In giving to these tumors the name of *ganglions*, under which Hippocrates and Galen appear to have designated them, and in the attempt to distinguish them under the name of *nodatio* from tumors called *nodus*, Jean de Vigo has but attempted a futile division; but at the present time not having it in our power to adopt any name to the exclusion of others, they are still designated under the title of knots (*noeuds*) after Paré; *painful sub-cutaneous tumors* as they are called by the English practitioners especially; or *neuromata* (neuromes), or *chondromata* (chondromes), which is the epithet used by Odier, and which has been generally sanctioned by the French pathologists. The accidents they cause, the excruciating (atroces) pains they excite, and their usual resistance to every kind of remedy, induce most patients affected with these tumors to demand of themselves to be relieved from them by extirpation. It is in fact the only efficacious means that surgery has to oppose to them. No doubt that by attacking them with caustic as Siebold the father did upon Siebold the son (Alexandre, *Op. cit.*, p. 21) we may also sometimes succeed in curing them; but the operation by this mode would be longer, less certain and in reality manifestly more painful. Amputation of the part, which Louis (*Encyclop. Method.*, partie Chir. t. II., p. 442), Odier (*Manuel de Méd. Prat. cité à l'art. Excision des Nerfs*), and M. Warren (*on Tumors*, etc., p. 62), are still in the practice of, would not be justifiable at the present time, unless by means of its degeneration the tumor had effected a profound alteration in the limb. As to extirpation, it would always be easy and simple, if it were true, as the title of *sub-cutaneous tumors* would seem to indicate, that *neuromas* were always found immediately underneath the skin; but observation has now shown that the deep-seated nerves as well as the superficial, become the seat of these tumors. It follows from this that the removal of neuromas may sometimes become a serious operation. They have moreover been encountered upon almost every region of the body. Franco (*Traité des Hernies*, p. 484.) speaks of a woman who carried one for ten years upon the tibia. Another woman, mentioned by Loyseau (*Obs. de Méd. et de Chir.*, p. 56.) had one upon the inner part of the thigh, and the same practitioner met with one in another woman upon the outer part of the same limb. Whether the small nodule removed by Pouteau (*Œuvres Posth.*, t. I., p. 5.) was or was not a neuroma rather than a simple nodular induration, it was found nevertheless, in front of the malleolus at the place where the saphena is opened in bleeding of the foot. M. A. Petit (*Discours sur la douleur*, p. 15, an VII.) also relates that he had met with them almost exclusively upon the legs, though he had seen one also upon the fore-arm. In the case mentioned by Valsalva, as related by Morgagni, (*De sedibus et*

*causis morb.*, epist. 50,) the tumor was situated upon the malleolus. In the case of Cheselden, (*Anat. of the Human Body*, p. 256, tab. 28, fig 7,) it was seated in the ulnar nerve. Petit (*Mém. de l'Acad. de Chir.*, t. I., p. 90,) mentions another in which it existed upon the arm. In one of the female patients of Camper (*Demonstr. Anat. Path.*, lib. I., cap. 2.) it was upon the outside of the elbow; and in another woman mentioned by the same author, upon the front part of the knee. The patient amputated by M. Warren (*on Tumors*, &c., p. 60) had one upon the tibia below the knee. The tumor spoken of by E. Home, (*Trans. for the Improvement of Med. and Chir. Knowledge*, vol. II., p. 92,) and which was removed by Hunter, was also situated upon the arm: and in the patient of E. Home himself, the tumor had to be seized in the hollow of the axilla. A. Dubois, (Spangenberg, *Archives de Hom.*, t. V., p. 306,) in one case saw the neuroma in the neighborhood of the patella, and on the middle of the arm in another. The tumor dissected by Hasselbach (Alexandre, p. 22) occupied the ulnar nerve, and that of Siebold (*Ibid.*, p. 21) the space between the two malleoli. Neumann (see Siebold, t. I., p. 54) encountered one on the lower and middle part of the forearm. One of the patients of Rieche, (Alexandre, *op. cit.*) had the tumor on the inner part of the arm, and the other outside of the condyle of the humerus. M. A. Cooper (*Trans. Med. of Edinburgh*, vol. III., p. 640,) and M. Warren (*on Tumors*, p. 63,) have met with them in the breast or below it. Nicod (Descot, *op. cit.*, p. 244,) mentions to have seen them on the chest, and M. Marjolin (*Ibid.*, p. 245,) on the scrotum. In the patient of Short, (*Obs. de Méd.* t. IV., art. 27,) the tumor was situated upon the thigh; while M. Warren, (*on Tumors*, &c., p. 63,) saw one in a boy of sixteen years, below the great trochanter. With respect to myself, I have met with them on the sole of the foot, on the outer side and inner side of the leg, in front and on the inner and outer side of the thigh, twice even in the depth of this limb, on the right and left side of the thorax in two different women, on the right portion of the epigastrium, near the wrist, and on many points of the fore-arm; in the body of the biceps muscle, on the track of the musculo-cutaneous nerve, and in the depth of the carotid region. What I have observed, and which is in accordance with what is related by authors, proves, in contradiction to what Descot (*op. cit.*, p. 210,) alleges, that these tumors are more frequent in adult or old age, than in children. One of the women whom I had an opportunity of examining was sixty years of age and upwards; another was 40, a third 36, and the youngest 21. The same has been the case with the men, who were 30, 40, and 50 years of age, and even older. If one of the patients of Reiche was only 19, the other was 44; those of Morgagni and Petit were young girls, and the cases of Camper, E. Home, and Louis were clearly women. Nor were those of Dubois and Hasselbach young subjects, while the case of Neumann was 60 years of age. These details prove moreover, that if M. Wood has met with neuroma in women only, this must be ascribed to accident only, since numbers of men have also been affected by it. We must add that cases of neuroma have been noticed also by Bicet, Pearson, Broon, Newbigging, Swan, Hall, Windsor, Laing, Walker, Hey,

Simson, Gooch, Jacopi, Monteggia, Craigie, Mojon, Capel, De Haen, Leduc, J. Bell, W. Blizzard, Marandel, Beauchêne, Richerand, and some others, all of which have been collected by M. Wood in his *Memoir* (pages 324, 326, 329, 330, 334, 345, 350, 353, 354, 390); and by Descot in his *Monography* (pages 252, 253, et seq.) As to the efficacy of extirpation in neuromas, it is no longer at the present day allowable to call it in question. The woman operated upon by Franco had been for ten years in a perpetual torment. The tumor, which was of the size of a small nut, had scarcely been removed, when the suffering ceased forever. In the two examples cited by Loyseau, the pain, which became excessive as soon as the patients began to get warm in bed, also disappeared immediately after the operation, which the surgeon believed he could render more effectual by afterwards cauterizing the wound. The same result was obtained by Pouteau, though in the case mentioned by this practitioner, the pains were so excessive as to occasion convulsions in the left side. One of the most curious facts of this kind is that of Short. In fact, though epilepsy appears to have sometimes originated from some small tumor of this nature, or from a nervous cicatrix, and that Lassus has been enabled to cite Hippocrates, Galen, Celsus, and Alexander of Tralles in support of this, we find in none of these authors an example so conclusive as that of the English Physician. A woman affected with epilepsy for twelve years had up to that time had the paroxysms only once a month; but they now began to appear four or five times a day, and to continue for an hour or an hour and a half. As they began always with a pain at the lower and inner side of the calf, Short examined the leg of the patient during one of these paroxysms. Plunging in a scalpel to about two inches in depth, he felt a small body which he separated from the muscles and excised. It was a hard cartilaginous mass, or sort of ganglion, of the size of a pea, situated upon a nerve which the surgeon divided with the same stroke of the instrument. The patient, who was immediately relieved of her paroxysm, cried out that she was perfectly well, and never had an attack afterwards. The young girl mentioned by Morgagni, and in whom the pains were so acute that she would have cut off her foot herself had she not been prevented, was also very speedily cured by the removal of the tumor. The same occurred in the case of Petit, who also speaks of the intolerable pains. In the patient of Cheselden, who experienced a numbness only at certain times, but suffered acute pains upon the least shock, the operation was no less fortunate; as it was also in the two women operated upon by Camper, the one treated by Hunter; and the patients of Dubois, Siebold, M. Reiche, &c. Surgeons of the present day, therefore, who would decline an operation of this kind, would be censurable. There is every reason to believe for example, that a patient who after an amputation of the thigh, continued for two years to suffer the most excruciating pains, which he referred to the extremity of his foot, might have been relieved of his misery, if the species of swelling or tumor which had formed above a portion of a branch of the sciatic nerve which had been included in the ligature of the vessels, could have possibly been extirpated. (Portai, *Anat. Méd.*, t. IV., p. 289.) The case, mentioned by Portai, who



states that he saw the specimen at Montpellier in the museum of Lamorier, reminds me of an observation: those nervous sympathetic pains, which occasionally persist for so long a time, and which many who have been amputated refer to limbs which they no longer have—are they not imputable to the fact that nervous filaments have in reality been included in the ligature with the vessels? [See remarks on this subject in Vol. I., under *Bleeding*; and Vol. II., under *Nerves*.]

#### ARTICLE I.—EXTIRPATION OF NEUROMAS IN GENERAL.

Neuromatic tumors, in relation to their cure by extirpation, present three varieties. Some are situated between the aponeuroses and the integuments, and others are found under the aponeuroses at a depth which ordinarily corresponds with the track of the nerves. If there are some which seem to be continuous with the nervous cords, there are others which appear to have no kind of connection with this description of organs.

##### § I.—*Sub-Cutaneous Neuromas.*

Whether they be continuous or not with the nervous branches, sub-cutaneous neuromas should, nevertheless, be extirpated nearly in the same manner in all cases. An incision of sufficient length is first made upon a line with the tumor itself. After having thus divided the skin and cellular tissue, the surgeon secures the tumor with an erigne and causes it to be raised up by an assistant while he isolates its sides. With a stroke of the bistoury or scissors, he then immediately after detaches its upper portion, then the deep-seated surface, and then its lower extremity. In this manner he annihilates with the first cut of his bistoury, by separating the nodule from its nervous centres, those painful irradiations sometimes insupportable, which he would otherwise occasion before having terminated the operation. Prudence would require that a layer of cellulo-adipose tissue of sufficient thickness should be removed with the neuroma. Unless the tumor should have acquired an extreme volume, that of a small melon for example, as in the patient amputated by Louis, or that of Ant. Dubois, the simple incision ought to be sufficient. A neuroma which should equal the size of a pullet's egg, as in the two cases reported by Reiche, would in almost all cases exact nothing more. As these tumors are usually sufficient regular, their dissection generally is easy. The tissues moreover by which they are surrounded, being in the normal state, are placed in excellent conditions for immediate reunion. It is on such occasions therefore, if ever, that we should approximate as accurately as possible the flaps or borders of the wound, and attempt the cure by first intention. Having a regular point d'appui or sort of barrier or protecting plane in the aponeuroses or bones which are found underneath the integuments, the surgeon experiences no difficulty in effecting the exact coaptation of the two opposite walls or lips of the solution of continuity. If, however, these tumors should have required, either in consequence of their volume, their degenerescence or some

anomaly in their form, the formation of numerous flaps, or a cavernous wound, we must proceed in the manner mentioned in the article on *Lymphatic tumors*. In other respects the wound which is made by the extirpation of sub-cutaneous neuromas, is a simple wound, and is to be considered in no other point of view.

### § II.—*Deep-seated Neuromas.*

Whenever it becomes necessary in order to reach the neuroma, to divide the aponeuroses, the operation becomes manifestly more serious. The limits of the tumor being less perfectly ascertained, do not enable us at first to regulate the extent of the incisions with all the precision desirable. To detach a sub-cutaneous neuroma we scarcely ever are in danger of wounding any important artery; some veins only can then embarrass the surgeon. In sub-aponeurotic neuromas, on the contrary, we have to guard against enormous vessels, and the same organs as in the case of lymphatic tumors. The incision of the integuments being made, we again endeavor by means of the finger carried to the bottom of the opening, to identify the exact position and size of the tumor, in order, without arresting the operation, to enlarge the external wound should it be deemed necessary. Dividing afterwards the aponeurosis with free cuts from without inwards, should there be neither large sized arteries, veins, or nerves in the neighborhood; but on the contrary, by puncture at first, and from within outwards, and on a grooved sound, when we have to proceed with caution; the surgeon then stops to examine anew the precise seat of the neuroma. While an assistant keeps the lips of the solution of continuity properly held apart, he continues to divide the tissues with care, and layer by layer, until the tumor is laid bare. He then secures it with a hook and causes it to be drawn upon by a second assistant, in order to facilitate him in isolating its two sides either by dissection or enucleation. Before separating it above or below, it is necessary to know if it belongs to a small or large nerve. In the first case, in fact, there is no necessity of our having recourse to a minute dissection in order to detach it, and to isolate it from the nervous filaments which surround it. We may without danger cut freely and completely through its two extremities, since the interruption of the functions of such nervous filaments, cannot create any very great degree of disturbance in the uses of the part which sustains them. If on the contrary the nerve is important and voluminous, we should endeavor, unless the thing should seem wholly impossible, to disengage it from the tumor and to dissect and isolate from it the filaments sometimes dispersed through it, (*éparpillées*), and do every thing in fact to preserve its continuity while removing the neuroma. If, however, as has happened in a great number of cases, the nerve and the tumor are perfectly confounded together, we should decide upon removing the part degenerated, taking care to commence the section at the upper part of the tumor in order that the remainder of the operation may not be made more painful. In this manner it has been found practicable to remove one or two inches of the ulnar, radial or median nerve, without any very serious accidents, or permanent paralysis resulting therefrom. The

tumor being removed, whatever be the process, we must proceed to the ligature or torsion of the arteries, the arrestation of the hemorrhage by the known means, and the treatment of the wound in the manner described under operations in general; not forgetting that even under these circumstances the attempt at immediate reunion presents numerous chances of success. Nevertheless as we have here the supple and lamellar cellular tissue which separates the muscles, to transport inflammation and suppuration to distant points, we should not be too anxious for the immediate closure of the wound, when we find it impracticable to keep the different portions of it in the most exact coaptation possible.

## ARTICLE II.—EXTIRPATION OF NEUROMAS IN PARTICULAR.

### § I.—*Superficial Neuromas.*

Whatever be the region in which they exist, sub-cutaneous neuro-matic tumors are to be extirpated by a process which is the same every where, and for which the rules above given will be found sufficient.

A. *At the sole of the Foot.*—The limb being flexed and turned upon its outer side, I made an incision opposite the neuroma of an inch in length and parallel to the axis of the limb; having secured this tumor with an erigne, I glided underneath it the point of a straight bistoury, and readily separated it from the neighboring tissues, first behind and then in front. No arterial branch being opened, I was enabled to close the wound immediately, and to keep it thus united by a circular strip of adhesive plaster. The cure was accomplished at the end of a week.

B. *On the internal malleolus*, and on the whole antero-internal side of the leg we are to proceed, and would succeed in the same manner.

C. On the *knee* and in the neighborhood of the patella the limb should be extended or flexed, according as the tumor is more or less movable; but we must not turn it upon its outer side. After having laid bare and removed the tumor and united the wound, the limb should be placed also at the ham in a state of moderate flexion upon a pillow or large cushion.

D. For the anterior, inner, or outer side of the *thigh*, we should proceed in the same manner, without any necessity of more serious precautions after the operation. If the tumor was situated upon the outer or posterior region either of the leg or thigh, the surgeon would find some advantage in making his patient lie upon his belly. Nevertheless the incision of the skin, the excision of the neuroma, and the dressing, would be as in the preceding cases; and for the rest we should take care not to let the limb press upon the diseased region.

E. Neuromas of the *hand* or *fore-arm* are to be removed after the same rules. In all cases the limb should be placed so that the tumor should present itself in front of the operator, and in all cases also the wound could be united by means of strips of adhesive plaster or any other bandage. In the case of Neumann the tumor which had



existed for more than thirty years, was situated upon the lower and middle part of the fore-arm. After having divided the skin, it became necessary to tie several arterial branches, though the neuroma was only the size of a pea, and appeared to occupy a branch of the cutaneous nerve. It is difficult, however, to understand why Neu-mann was fearful of proceeding any farther, or that he should have thought it advisable to confine himself to narcotics and afterwards caustics to complete the operation. I have already said moreover, that the patient, who was seventy years of age, died of apoplexy before being cured of his wound. If, as in one of the cases of Camper, the neuroma should be situated outside of the elbow, and on the track of some of the branches of the musculo-cutaneous nerve, we should after having separated the limb from the trunk, keep it in a state of moderate extension during the whole course of the operation. It is important here that we should guard against the synovial capsule, and not penetrate deeper than is indispensably necessary in the direction of the articulation.

F. Upon the continuity of the arm, we should also have to turn the limb inwards or outwards upon its axis, according as the neuroma was placed more on one side than the other, and we should also have to guard against wounding the basilic or cephalic veins and the sub-aponeurotic organs. The thoracic limbs moreover, are those in which the dressing is most simple, and where the wound would have the best chance of cicatrizing by the first intention.

## § II.—*Deep-seated Neuromas.*

A. *The Thoracic Limbs.*—The extirpation of deep-seated neuromatic tumors has already been performed upon a great number of different regions.

I. I do not know if it has been employed upon the fore-arm. In all such cases we should have to divide the integuments and isolate the tumor in this region, in the same way as for cutting down upon the radial, ulnar or median nerve. In the case of Cheselden it is clearly perceived that the tumor occupied the middle of the *ulnar nerve*; but it is not mentioned if it was in the arm or fore-arm. Having separated the muscles apart and isolated the tumor, it would be necessary to detach the nerve from the artery before completing its double section. The *median nerve* being nearly at an equal distance from the two principal arteries of this region, might, so far as regards any immediate danger in the manipulation, be excised with less apprehension.

II. In the *arm* the neuroma may occupy the radial, ulnar or median nerve, or the cutaneous nerves. a. E. Home says that the tumor extirpated by Hunter, in a woman aged 20 years, was situated upon the *musculo-cutaneous nerve*; having laid bare the neuroma by a proper incision, he excised about three inches of the nerve. The loss of sensibility, which at first showed itself in the thumb and forefinger, did not long continue, and the patient was completely re-established. A woman, upon whom I operated in 1838 at the hospital of La Charité, had at the middle of the left arm in the substance of the biceps, a small ovoid movable tumor with painful irradiations, which had existed for a great number of years, and produced the symptoms

which usually attend neuromas. Having separated the arm from the trunk, I made an incision of two inches between the lower extremity of the deltoid and the origin of the supinator longus muscle. Dividing the tissues, layer by layer, I arrived at the fibres of the biceps muscle without touching the cephalic vein, and then reached the tumor, which I secured with an erignè, and then excised. The acute pain which the woman experienced every time I touched this neuroma, the greyish looking stem which was prolonged above and below, and the numbness of the entire outer side of the fore-arm after the operation, sufficiently prove, as I think, that the tumor in reality occupied the trunk of the musculo-cutaneous nerve. The wound was united by first intention, and except for a diffused erysipelas which spread from an issue which the woman carried in her arm, the cure would have been completed at the expiration of a week.

b. Upon the large nervous trunks the operation might be much more dangerous. The neuroma of the size of a melon, which according to Dubois, occupied the *median nerve* of the right arm, required the crucial incision, and the excision of a considerable portion of the nerve. The cure was accomplished, but the sides of the fingers remained insensible. It does not appear that Petit was under the necessity of making use of a complex incision for the removal of that neuromatic tumor of the size of a pullet's egg, which had existed for seven years in the arm of a young girl. As it was suspended, according to the author, to a small nervous cord, we may consider that it was situated upon one of the cutaneous nerves.

c. In the first case of Reiche, it was evidently situated upon the ulnar nerve. The surgeon, after having taken up a fold of the integuments, divided them to the extent of five inches. The dissection of the tumor obliged him to divide many small branches of arteries, without, however, occasioning any serious hemorrhage. It became necessary to remove with it about four inches of the nerve. The pains, which were very violent at first, afterwards diminished and changed in their nature, and were soon followed by a numbness in the hand. The wound was cicatrized in fifteen days, and nothing ensued from the operation but a slight degree of insensibility in the little finger. We should operate here, therefore, in the same way as for cutting down to, and tying the brachial artery, with this difference, that we are guided by the tumor, and that while raising up this last during the dissection, it is generally easy to reach the nerve and to excise it, by commencing in the direction towards its root.

d. In the hollow of the axilla, neuromas may also have their seat over the aponeuroses. E. Home, who had to cut down upon one of this kind contiguous to the great axillary nerve, says, without designating the process he adopted, that he effected its excision, and that the operation caused neither any great degree of pain, nor any other unpleasant symptom as its immediate consequence; but he adds, that a violent inflammation soon supervened in the region occupied by the tumor, and that it occasioned the death of the patient on the eighth day. The arm in these cases must be held wide apart from the chest, and the tissues are to be divided after the rules laid down for a ligature upon the axillary artery, rather than after those for the extirpation of lymphatic tumors. Neuromas, in fact, will be found to

be resting against the root of the arm, instead of tending, like degenerate lymphatic ganglions, to glue themselves against the thoracic wall of the axilla. The best means of avoiding the misfortune mentioned by Home, in such cases, would be to dress the wound with small balls of lint, in place of immediately attempting its union by first intention.

B. *The Abdominal Limb.*—I. Every thing goes to show that there is no deep-seated nerve of the *leg* which is exempt from neuromas. Up to the present time, however, the extirpation of these tumors at the foot and upon the whole length of the abdominal member, has scarcely been spoken of except under the title of sub-cutaneous tumors. The case of Short is almost the only one which would appear to coincide with a profound neuroma. Here no doubt can exist, for the author says he plunged in his scalpel to the depth of about two inches, and that he was obliged to separate the tumor from the muscles before extracting it with the forceps. We should have to be guided, moreover, by the precise situation of the tumor and the known track of the nerves of this region.

II. It is not known whether the neuromas of the *knee* or in the neighborhood of the patella, extirpated by Camper and A. Dubois, were rather sub-aponeurotic than sub-cutaneous; but the natural arrangement of the tissues of this region, induces rather to the opinion that they were in reality superficial tumors.

III. Though it might appear that the tumors extracted from the thigh by Loyseau, were situated between the aponeurosis and integuments, it is at least certain that in one of the patients whom I have already spoken of, and who had them on different parts of the body, the disease had its seat underneath (au-dessous) the fascia lata.

IV. This patient having died, we had an opportunity of practising upon the dead body the operation that might have been performed upon him during life. One of the tumors which was situated upon the antero-external lower third of the thigh, was laid bare by an incision two and a half inches long. Having reached below the aponeurosis, I had still to isolate it from among the fibres of the triceps muscle. There it appeared to form an immense spindle-shaped ganglion, of the size of a nut, upon the continuity of one of the branches of the crural nerve. A similar tumor located in the upper third of the limb, was situated underneath the sartorius, and would have rendered necessary the division of a part of this muscle.

V. *The sciatic nerve.* The most remarkable neuroma I have seen, was situated upon the posterior part of the thigh, at four fingers' breadth below the breech. The tumor, which had existed for many years, and had developed itself without any known cause, in a lady aged thirty years and upwards, was of the size of the head of a newborn infant. Assisted by M. Gorsse, the physician of the patient, I extirpated it in the following manner. Being placed upon her belly, with a pillow under the trunk, Mlle. H. was held in this position, while the leg was kept extended by other assistants. Having made an incision in the integuments parallel to the axis of the trunk, and six inches in length and commencing at the outer border of the ischium, I had to cut through the sub-cutaneous fascia, the fascia lata and sundry adipose layers before perceiving the tumor. Having



isolated it on its posterior surface, it was secured with a hook and drawn backwards, while I detached it on its inner and outer side by means of a careful and delicate dissection. I disengaged it in this manner from the long portion of the biceps, which was pushed inwards with the semi-tendinosus and semi-membranosus. It was not until then that it became evident that the sciatic nerve supported the whole of this mass, of which it formed as it were the axis. The fear of inducing gangrene, or at least an incurable paralysis of the limb, by excising a nerve of this volume, caused me to hesitate an instant. Seeing however that the tumor was perfectly free at the middle of the great cellular track, (*trainée*), which extends from the ischium to the ham, I asked myself the question, if it might not be possible to divest it of the nervous filaments and to remove it alone. After having therefore detached its whole circumference and dissected the nerve, first above and then below, as for an anatomical preparation, I recognized that there was nearly a third of it intact, or as it were enchased merely upon the anterior plane of the neuroma. The two other thirds of its cords were dispersed in the manner of the grill-work (rayons) of a cage or oyster panner upon the two sides of the tumor. Encouraged by the extreme fortitude of the patient, I proceeded to isolate each one of those filaments by means of the bistoury, and succeeded in disengaging nearly the whole of them while pushing them towards their common centre in front. The neuroma thus removed left a cavity as large as the two fists, which I first filled up with small balls of lint, and then treated by secondary immediate reunion. The cicatrization of the wound appeared complete at the end of five weeks. An evident numbness and partial paralysis of the outer half of the foot and of the neighborhood of the corresponding malleolus, were the only accidents calculated to give me any uneasiness during the first week or two after this serious operation; but these symptoms subsided by degrees, and the cure, which was completed at the expiration of three months, remained permanent. It was in 1834 that the operation was performed. Mademoiselle H. married, and at the present time (December, 1838) is in the enjoyment of perfect health. Messrs. Roux and Chelius have each published a similar case, except that in the patient of M. Roux the tumor, which was of a cancerous nature, reappeared and terminated in death.

VI. I am not aware that other physicians have spoken of neuromas in the neck; for myself, however, I have every reason to believe that the tumor mentioned by M. Bérard, senior, and which I have spoken of under the article on *Excision of the nerves*, was one of this kind. I will add that in a dead body dissected by M. A. Thierry, I ascertained the existence of a spindle-shaped tumor of the size of a small pullet's egg, and of a reddish tint, on the middle of the continuity of the great sympathetic nerve at its cervical portion. It seemed as if this tumor might be a nervous ganglion excessively hypertrophied, and as it was no more adherent than normal nervous ganglions, it would have been evidently practicable to have cut down upon and extracted it, had it during life caused any serious symptoms. Proceeding in the same manner as for a ligature upon the carotid artery, it might have been removed without difficulty; and I do not think

the excision of a portion of the great sympathetic in a case of this kind, could be followed by any very formidable disturbance in the animal economy.

VII. Upon the thorax I have in four instances removed neuromatic tumors. Madame de T. for many years suffered neuralgic pains in the right side of her chest. A little tumor of the size and form of an almond, which had been noticed by M. Rayer, and which appeared to be the source of her sufferings, was situated between the 10th and 11th ribs, precisely at the place where the cincture of the gown is worn. To reach it, I was obliged by means of an incision of two inches, to divide the integuments, the sub-cutaneous fascia, some fibres of the latissimus dorsi and obliquus externus muscle, and afterwards the fibro-cellular layer which covers the external intercostals. Being hooked fast to and raised up by an erigne, the tumor caused a violent paroxysm of pain, and as it prolonged itself in front and backwards by a yellowish stem, it presented to me completely the appearance of a nervous ganglion. Having excised it posteriorly and then in front, I found there was no artery to tie, and drew the lips of the wound together by two strips of adhesive plaster, which I covered with a pledget of lint and body bandage. Some slight suppuration ensued, but the cure was nevertheless completed after the expiration of a short time. In the following year, that is, in the month of March, 1837, I was obliged to subject Madame de T. to a similar operation. A new neuroma had shown itself at an inch below and behind the first; the operation and its results were the same, and the patient has, up to the present time, (December, 1838,) remained free from any new trouble from this source. A young girl of 19 to 20 years of age, whom I operated upon at the hospital of La Charité in 1836, had at the same place, but upon the left side, a trilobate tumor of the size of a large nut, and which also presented the characters of neuroma. In this case an incision of three inches was required, and the tumor was almost entirely sub-cutaneous. Having dissected and removed it, I was nevertheless not enabled to close the wound by first intention, and the cure was not effected until at the expiration of five weeks. Another neuroma which I also met with on the thorax of a woman, was likewise situated at the same height. Are the constriction or frictions made there by the cord of the petticoat or the cincture of the frock, the cause in these cases? The case of the man which I have already several times alluded to, and who had so many neuromas dispersed over the chest and limbs, had one also between the cartilaginous border of the tenth rib and the umbilical region. In order not to be incommoded by the natural depression of the side, I laid bare the tumor in this case by means of a transverse incision slightly convex below. It became necessary therefore to cut through the skin, sub-cutaneous fascia and externus oblique muscle, for the tumor was situated quite deep. The extirpation was not in other respects difficult, but it required a ligature upon two arterial branches and left a sufficiently extensive cavity underneath the integuments. This patient, though cured of the operation, having a cancerous affection of the bones of the left wrist, underwent at a later period amputation of the fore-arm, which terminated in death at the expiration of twenty

days in consequence of numerous metastatic abscesses in the viscera and an enormous effusion in the pleura.

VIII. *Recapitulation.*—Neuromas as we thus perceive being ordinarily uniform and perfectly isolated in the midst of the other tissues, may be extirpated without great difficulty in almost all patients. If they occupy small nerves it would be a useless precaution to endeavor to detach them from these, rather than to excise the nerve and the tumor at the same stroke. In the contrary case and especially if the sciatic nerve were involved, we should do our utmost to detach the nervous filaments from it, at least in part, as I succeeded in doing in the case mentioned farther back. If this separation were utterly impossible and the accidents caused by the neuroma were really serious, we should still finish the operation, at the risk of interrupting the continuity of a large nerve. The facts which I have related under the article on *Excision of nerves*, and those which have been considered in this chapter, prove that the consequences of such an operation rarely compromise the life, that they do not always alter the functions of the limb to an incurable extent, and that very frequently in fact the phenomena of sensation and motion which had been believed to be permanently destroyed, are ultimately more or less perfectly re-established.

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## CHAPTER V.

### LIPOMAS, OR FATTY (Graisseeuses) TUMORS OR WENS (Loupes).

Ever since surgeons, aided by the light of analysis, have sought to distinguish tumors rather by their nature than their form, the word *wen* (loupe) which was employed at first to designate all tumors, is scarcely ever used any longer except for such as are composed entirely of fat, which are the only ones recognized at the present time under the name of *lipoma* (lipome). After the example of some modern pathologists, therefore, I would understand by the word *loupe* or *lipoma*, which was invented by Littre (*Hist. de l'Acad. des Sc.*, 1709), tumors constituted of pure or degenerate fat. This species of disease which belongs to the class of hypertrophies, involves no danger in itself, and in reality incommodes only by its volume or weight, or the deformity it produces. Nevertheless lipomas appear to me to be susceptible of many kinds of transformation or decomposition. It is not impossible perhaps that they may undergo even cancerous degeneration; the putrescent transmutation (la fonte putride), however, is one of their most usual terminations. As on the other hand, however, these tumors scarcely ever disappear by resolution, and as their augmentation has no determinate limit, surgery must necessarily interpose its aid and devise means of disembarassing patients of them. The remedies adapted to them are reduced to a small number, and topical applications of whatever description are devoid of efficacy. General remedies would be more dangerous than useful.



There is nothing in fact in such cases, if we wish to do any thing effectual, but the mechanical or chemical destruction of the tumor that can be resorted to; so that the entire therapeutic of lipomas definitively resolves itself into this principle: that is, to destroy them by caustics, the ligature or the cutting instrument, or to do nothing at all. So long as the lipoma possesses little volume, is imperfectly defined, or scarcely causes any inconvenience, or is deeply situated, we may, if there is reason to believe that its increase will not ultimately render its destruction more dangerous, wait and do nothing, or confine ourselves to some hygienic precautions. On the contrary, whenever the lipoma is superficial, well-defined and easily accessible to an operation, it is much better to attack them at once than to temporize. Though it should even be unfavorably situated, we ought to advise the patient to get rid of it in good season, inasmuch as the operation, the longer it is delayed, since it must ultimately become indispensable, presents so much the less chance of success, in proportion as the tumor is of older date or more voluminous. On this point I will take the liberty of making a remark.

Fatty tumors are far from being situated always in the sub-cutaneous tissue, as most modern pathologists maintain. Without mentioning those which are seen in the chest, abdomen and pelvis, they are sufficiently often met with also, underneath the aponeuroses and even in the central portion of the limbs. It is easy to comprehend also that lipomas may exist wherever the adipose cells are naturally intermingled with the other tissues; so that we ought to have reason to be astonished rather at their absence than their presence between the muscular layers and bundles (*faisceaux*). There are, therefore, under this point of view, two classes of lipomas: the *sub-cutaneous* or superficial, and the *sub-aponeurotic* or deep-seated, in the same way also as there are two kinds of neuromas and two orders of lymphatic tumors. In respect to regions for which they have a predilection, it would be difficult to specify them; for fatty tumors have been observed upon almost every part of the body. I have met with them on the supra-hyoid region, on the cheeks and forehead and in the supra-clavicular region, upon the shoulder, at the middle of the arm, on the anterior border of the axilla, in front of the sternum or abdomen, at the nape, on the back, in the fold of the groin, at the perineum and upon the thighs and legs. Dupuytren (*Journ. Hebd. Universel*, t. IV., p. 28.) speaks of a lipoma which occupied the lumbar region. Dorsey (*Elements of Surgery &c., Journ. des Progrès* t. IX., p. 281.) mentions the case of a lipoma which was situated upon the dorsal region, where I have also seen them in two instances. In the patient of M. Graefe (*Gaz. Méd.*, 1835, p. 169.) the tumor was situated between the muscles of the abdomen; and below the clavicle in the case of M. Portulapi (*Bulletin de Férussac*, t. I., p. 240. *The Lancet*, April, 1824, p. 24.) In a patient mentioned by M. Taramelli, the lipoma extended from the groin to the perineum (*Bull. de Férussac*, t. XVI., p. 85.); while that extirpated by M. Taillefer (*Gaz. Méd.*, 1837, p. 93.) was situated in the dorsal region. M. Serre (*Ibid.*, 1838, p. 266.) has seen one at the posterior region of the neck and M. Syme (*Edinb. Med. and Surg. Journ.*, vol. 137, p. 381.) met with a curious example of one in the hollow of the axilla.

Thus, as I shall describe farther on, I have encountered enormous fatty tumors in the posterior region and depth of the thigh, upon the acromion, on the arm, at the side, under the axilla, &c.; so that there is nothing more variable than lipomatous tumors, both as regards their form, depth or volume, or the region where they are situated. We may consult on this subject, Chopart, Louis, M. S. Cooper, Alibert and M. Pautrier (*Thèse* No. 6, Paris, 1834.) There is scarcely any other mode of curing lipomas except by the ligature or extirpation. Though the red-hot iron or caustics, properly so called, might be applied without any very great danger to sub-cutaneous lipomas, it would be a different case with those that are deep-seated. It is moreover a kind of remedy which is not suitable to lipomas that are greatly developed, and one which in no case deserves the preference over the two other operations which I have just mentioned.

The ligature for lipomas, sometimes sufficient, rarely preferable, and never indispensable, would not be conveniently applicable but to those which were pediculated or not of large volume. It should be applied, moreover, with the same precautions and by the same processes as for cutaneous and erectile tumors. It would also be applicable for fatty tumors, as for all others, to strangulate their roots after having dissected them, if there should be any great difficulty experienced in avoiding the deep-seated vessels; but their extirpation is, in truth, the best, and I might say, almost the only resource. In cases of sub-cutaneous lipoma, nothing is so simple as this operation. If the tumor is but of little volume, a straight smooth (unique) incision is first made through the integuments, either a T, or crucial, or semilunar, or a V, or L, or an ellipse, or even stellated, if any advantages are to result from it. As the tumor contains no liquid, there is no danger in wounding its tissue while cutting through the skin. As these tumors do not usually contract any intimate adhesions with the neighboring tissues, they are generally easily isolated and detached from the surrounding cellular texture; though even some pelotons should be left behind, the cure would not on that account be materially interfered with; and as they receive no large-sized vessel, they may be extirpated without incurring the risk of any serious hemorrhage. The teguments with which they are surrounded being scarcely ever diseased, may be preserved, reversed, and then approximated in such manner, after the operation, as to be brought into contact at every point. The bottom and flaps of the wound being almost constantly composed of sound tissues, surprisingly facilitate all the efforts at immediate union or primitive agglutination.

The extirpation of lipomas is thus one of those operations which are performed with the least repugnance, and undertaken with the greatest degree of confidence. Nevertheless, it would be wrong to decide upon it on too slight grounds. An adult man, strong, and of good constitution, and about fifty years of age, came to the hospital of Saint Louis, in 1822, for the removal of a lipoma of the size of the two fists, and situated upon the postero-superior part of the right shoulder. The extirpation of this tumor, which was performed by M. Richerand, presented at first nothing peculiar. But an erysipelas, which ultimately extended from the shoulder to the nape, and from the neck to the cranium, soon put a period to his life. An old

man who had a lipoma, larger in volume than the head of an adult, appended as it were to the posterior region of the neck, operated upon by M. Roux, in 1825, at the hospital of the Faculty, also perished in a few days. When, therefore, we decide upon extirpating lipomas, it is important to guard against the general consequences of operations, in the same way as in the extirpation of all other sorts of tumors.

#### ARTICLE I.—SUB-CUTANEOUS LIPOMAS.

The arrangement of the incisions and the character of the operative process, ought moreover, in general, to vary, according to the size, form, and seat of the tumor. M. Gensoul (Pautrier. *Thèse* No. 6, Paris, 1834,) who, like MM. Rust, Walther and Textor (*Rust's Hand. der Chir.*, t. VI., p. 683), first plunges a long knife through the root of the tumor to separate it, first on one side and then on the other, has the advantage of terminating the operation rapidly; but he runs the risk of sacrificing useful integuments and cutting out irregular flaps. It is better therefore to make use of the bistoury, and to divide the skin from without inwards, and to prepare flaps of suitable form and extent, to be well adapted to, and to cover over, the wound accurately after the removal of the tumor. Fabre (*Observ. de Chir.*, in-12, 1778) after having laid them bare by a longitudinal incision, and passed a ribbon through their base in the same direction, so as to enable him to draw them towards him, recommends that we should strangle their root by a ligature, which being tightened gradually during the dissection, has the advantage of pushing out (*chasser*) the tumor and benumbing the pain; but it is doubtful if this process, which is not every where practicable, finds many partisans at the present day. Complex incisions also are not indispensable but for lipomas of a certain size. By means of a straight incision I was enabled to remove from the root of the shoulder a lipoma of larger size than a pullet's egg. Nevertheless, if the integuments should be too much attenuated, the tumor approach the size of the fist or exceed it, or the skin have undergone the least degenerescence, it would be preferable to have recourse to complex incisions, and even to sacrifice a portion of the integuments, rather than rely upon a simple incision.

#### § I.

A young girl from the country, whom M. Rayer desired me to operate upon in his wards, at La Charité, had in front and below the left clavicle a trilobate lipoma, of the size of the fist. After having first made an incision through the tissues from the neighborhood of the sternum to the root of the shoulder, I then divided the skin from above downwards to the extent of two inches, making thus two triangular flaps, which were dissected and reversed, the one outwards and the other inwards. After the removal of the tumor these two flaps were readily raised up to the horizontal branch of the T and adapted to the bottom of the wound by means of strips of adhesive plaster.



## § II.

A man aged from 45 to 50 years, who had in the supra-clavicular depression a lipoma, which a charlatan, by means of different caustics, had transformed into a bleeding fungus, was received, in 1837, into the hospital of La Charité for the purpose of having his tumor removed. The integuments in this case being destroyed or degenerated, I was obliged to surround the lipoma with two curved incisions, and to remove with it an ellipse of the skin and of the celluloadipose sub-cutaneous tissue. An erysipelas supervened, but the patient, nevertheless, got well in a short time, as also did the young girl whom I have just spoken of.

## § III.

A woman of more than usual embonpoint, had between the lower border of the axilla and the side of the thorax a badly-defined lump of the size of an egg, which caused her, she said, acute suffering. For the removal of this tumor, which was continuous and without *any line of demarcation*, with the general adipose tissue, I required only a simple incision three inches in length, and parallel to the lower border of the pectoralis major near the chest.

## § IV.

Another woman from 35 to 36 years of age and whom M. Ribail had sent to me, had in front of the acromion and on the anterior surface of the right deltoid muscle, a lipoma, slightly flattened, lumpy (*bosselé*), and of the volume of a pullet's egg. I was enabled to remove this also by the straight incision, and the cure was not interfered with by any serious accident. A young girl who was sent to me by Doctor C. Piron, had a lipoma of the same size as the preceding on the acromial side of the left shoulder. Here the adhesions were such that I considered it proper to lay it bare by means of a T incision, whose stem was turned backwards and slightly outward. This patient was also cured.

## § V.

In the case of the young man mentioned farther back, and who had a slightly elongated fatty tumor of the size of the fist, below the lower jaw, I was equally obliged to recur to the T incision; nor did any inconvenience result from it, and the patient soon recovered. There is every reason to believe, however, that a semilunar incision, with its free border below, would have permitted me, by raising up by dissection the flap of soft parts thus circumscribed, to complete the operation with as much certainty and security.

## § VI.

Having to remove a lumpy (*bosselée*) lipomatous tumor of the size of a small egg, and of very irregular form, on the left side of the waist of a woman who was admitted into the hospital of La Charité in 1837, I limited myself to a simple incision of three inches in length, and parallel to the direction of the neighboring rib. Immediate reunion took place, and the patient was well in a few days, and without any suppuration. Recently, on the 18th of December,

1838, I removed a similar tumor which a student of medicine had upon his right side. I made a vertical incision slightly convex posteriorly, and in five days after the young man was cured. These examples, I presume, are sufficient to point out the different modes of extirpating superficial lipomas of moderate volume.

### § VII.

But if the tumor should be of a larger size, we must proceed in another manner, always, however, in conformity with the anatomical requirements of the region, or of the part where they are situated. If the ancients had given more details of their experience, we should probably have had evidence of large-sized lipomas having been noticed by them. That horrible tumor of the size of the head, and which subsided and increased, and hung near the ear of a baker, mentioned by Felix Plater, (Bonet, *Corps de Méd.*, t. III., p. 14,) was it not a fatty tumor? The one called steatomatous by Lotichius, (Bonet, t. IV., p. 322,) which was also of the size of a man's head, and likewise situated behind the ear, evidently belonged to the class of lipomas. We see also by a case of M. Serre (*Gaz. Méd.*, 1838, p. 266,) that fatty tumors upon the posterior region of the neck may acquire an enormous volume, and a weight of at least seven pounds. The one I noticed in 1825, and which occupied the same region, was not less voluminous than the steatoma mentioned by Lotichius or by F. Plater. It appears that M. Miller even had extirpated one of the weight of twenty pounds, and which M. Warren (*Surg. Observ. on Tumors*, p. 55,) was enabled to show entire to his pupils. Whatever may be the volume, lipomas of the posterior region, of the neck or ears, are nevertheless extirpated nearly in the same manner as superficial fatty tumors in general. While almost constantly sub-cutaneous in these regions, they have scarcely much greater breadth to their root when very voluminous than when they are in the condition of small lipomas. But the danger of their extirpation lies in the depth of their root, and in the thickness of their pedicle, much more than in the totality of their mass. There is nothing to avoid there but the occipital artery or the auriculo-mastoidean above, and some branches of the cervical arteries below. The patient operated upon by M. Serre recovered perfectly well, and there is nothing to induce us to think that the operation should be more dangerous here than anywhere else. A steatoma of the size of the head, which was situated upon the occipital region of a child two and a half years old, was removed by M. Seerig with perfect success, (*Arch. Gén. de Méd.*, 3e série, t. I., p. 115,) while F. de Hilden, (Bonet, p. 83,) on the authority of a letter of Screta, speaks also of a child two months old, and which was operated upon in this manner at the hospital of Strasburg, for an enormous tumor which it had on its nape.

### § VIII.

The posterior region of the trunk also has frequently presented these enormous lipomas. The alleged sarcoma of such prodigious size which formed between the shoulders in a woman mentioned by F. Plater, (Bonet, t. III., p. 14,) and which was successfully removed, was probably a degenerate lipoma. Dupuytren removed one of

these, which was partitioned off with several osseous plates, and which was situated above the lumbar region, in a woman aged sixty years. Dorsey (*Journ. des Progrès*, t. IX., p. 280,) states that he removed from the back of a man a lipoma which weighed twenty-five pounds. The cure took place rapidly, and the figure given by the author shows that this tumor held on to the trunk only by a sort of fold of the integuments. A friend of A. Petit, (*Anat. Chir. de Palfin*, t. II., p. 19,) by making use of the ligature, was enabled to separate from the dorsal region, a lipoma of twenty-eight pounds, and another of forty-eight pounds. A patient, seen by Petit himself, had one upon the back, which *must* have weighed at least sixty pounds. A lipoma in the same region, of four pounds' weight, was since extirpated by M. Taillefer, (*Gaz. Méd.*, 1837, p. 93,) who united the wound by suture, and cured his patient in fifteen days; so that on this plane of the trunk the extirpation of fatty tumors presents numerous chances of success, whatever may be their volume and weight.

## ARTICLE II.—SUB-APONEUROTIC LIPOMAS.

### § I.

Though lipomas may exist on the anterior region of the body, the remark, nevertheless, is true, that they are less frequently developed there than behind. The largest sized one I have noticed on the sternum did not exceed the dimensions of the fist. There is no proof to show that the tumor shaped like a ball, of the size of a man's head, and which was situated in the substance of the parietes of the abdomen, as mentioned by F. Plater (Bonet, t. III., p. 15), was a fatty tumor, rather than one of any other kind.

### § II.

That which M. Graefe (*Gaz. Méd.*, 1835, p. 169,) extirpated under the title of lipoma, and which was situated below the obliquus externus, was it in reality a fatty tumor? It is readily conceivable, moreover, that the operation would not be sensibly more difficult in front of the chest than in the dorsal region. But in the abdomen the case would be different if the tumor really had its seat underneath the muscles or aponeuroses. The risk of wounding the epigastric, internal mammary, lumbar or intercostal arteries, would here be among the least of the inconveniences to encounter from the operation. It is the neighborhood of the peritoneum and the development of inflammations and of consecutive suppurations, which would then be the real sources of danger.

### § III.

The same dangers would exist if the lipomas were developed in the sides or hypochondriac regions. Lotichius (Bonet, t. IV, p. 321,) states that he saw in the hypochondrium of a patient, a steatoma of the size of the head, and that the extirpation of this tumor undertaken by a charlatan, was followed by death at the end of two days. F. Plater (*Ibid.*, t. III., p. 15,) also speaks of a tumor which had a strong resemblance to the brain, and which existed in a young man, on the left side, near the back; but no one had the courage to undertake its



removal. That case of a *carcinoma*, also, which occupied the right hypochondrium, was of the size of a child's head, and extirpated with success, and the history of which is given by Bartholin, (Bonet, t. IV, p. 461,) was it not, perhaps, a degenerated lipoma? M. Warren (on *Tumors*, p. 57,) has extirpated a lipomatous tumor above the side and hypochondrium, and which was situated between the ribs and the lower portion of the serratus magnus.

#### § IV.

Be that as it may, it is in the vicinity of the root of the limbs and upon the limbs themselves, or on the thorax, that the largest sized lipomas have been noticed. I do not speak here of the man whom M. Sédillot showed me, and who had the whole circumference of his neck surrounded by an enormous collar-shaped (bourrelet) indolent, lumpy [bosselée] tumor, because I am no more certain that this was of a fatty character, than I am that that was in the child mentioned by M. Warren, (*Ibid.*, pl. 14, p. 428.) Another patient whom M. Lebatard sent to me in 1838, had the whole of the neck imprisoned, as it were, in enormous masses of a lipomatous appearance, at the same time that similar tumors existed in the axilla and groins; but neither here, also, am I certain that they were legitimate lipomas.

#### § V.

In the region of the *shoulder* they have been noticed above, in front, behind and outside. The patient operated upon successfully in 1823, by M. Portulapi, had a lipoma of fifty-two pounds' weight, the root of which was situated in the subclavicular fossa. Already this surgeon, in 1814, had removed another lipoma weighing fourteen pounds. Dupuytren (*Archiv. Gén. de Méd.*, t. V, p. 430,) removed one weighing six pounds, situated on the posterior part of the shoulder of a patient, who recovered; and I have, as I have said, observed many others of a certain size, which were situated also upon the stump of the shoulder, properly so called.

Though in the supra-clavicular depression, lipomas rarely acquire an extreme volume, they present here at least some particular features in connection with their extirpation, and dangers and difficulties which it is important not to be ignorant of. Those which are subcutaneous demand no further attention there than elsewhere. It is when they are situated beneath the aponeurosis, that their diagnosis and removal may be difficult. The softness of the neighboring tissues, the void which the hollow of the axilla opens to them in front and upon the outside, and the subscapular cavity behind, admit of their being depressed and flattened with extreme facility, and of projecting or disappearing, so to speak, in the manner of a congestive abscess (abcès par congestion) or varicose tumors, and of appearing soft like a hernia or abscess, or conveying the idea of a disease altogether different. I had a woman for several months at La Charité in 1838, who carried a lipoma of this kind in the left supra-clavicular depression, and who in this manner became the subject of very different opinions on the part of those who had an opportunity of examining her. Another patient whom I operated upon with M.

Maingault, had a tumor in the same region, whose size did not appear to exceed that of a pullet's egg. An incision extending from the outer border of the sterno-mastoid muscle, to the apex of the acromion in the direction of the omo-hyoideus muscle, enabled us, after having divided through the integuments and aponeurosis, to lay the tumor bare. In order to isolate it, it became necessary to divide many branches of the cervical plexus. Having arrived below the clavicle in front, and upon the anterior side of the border of the scapula behind, we recognized that this tumor, which seemed so accurately defined at first, prolonged itself into the hollow of the axilla, where it became necessary to penetrate the whole depth of my finger to detach it by enucleation from below upwards, from among the nervous cords which compose the brachial plexus. I removed in this manner, by a laborious and tedious dissection, a completely fatty mass of very irregular shape, and of the size of the fist. We left in its place an enormous cavity, which was filled with small balls of lint, and which ultimately cicatrized so perfectly and in so simple a manner, that the patient was enabled to return from Paris to Rouen at the expiration of a month.

#### § VI.

It is rare that lipomas acquire in the arm or fore-arm, sufficient size to require our attention to be called to them as tumors of a remarkable character. The thoracic limb properly so called, is in fact one of the regions of the body where fatty tumors are the least frequently observed. Upon the supposition that the species of steatoma which was situated underneath the skin of the fore-arm in a patient mentioned by M. Galenzowski, (*Journ. des Progrès*, t. VIII., p. 221,) was a lipomatous mass, rather than a tumor of some other description—this at least would be an exception; for I repeat that lipomas of the upper extremity rarely exceed the size of an egg, and it would be difficult if not impossible to cite a series of examples where they originated underneath the aponeurosis. Fabre (*Observ. de Chir.*, in-12, p. 51,) however gives a remarkable instance of one. The tumor was monstrous. Extending from the apex of the deltoid to the external condyle of the humerus, it was prolonged transversely under the cephalic vein, then between the brachialis internus and biceps muscles, continuously with the external aponeurotic intersection of the arm.

#### § VII.

The *thigh* on the contrary has often been invaded by this description of tumors, and it is there especially that we encounter them of a remarkable size. M. Taramelli (*Bulletin de Férussac*, t. XVI., p. 85) states that he successfully extirpated a lipoma weighing eight pounds, which reached from the root of the fold of the groin to the perineum. A tumor which weighed eighteen pounds, and whose root ascended into the pelvis at the perineum, and which M. Kohlrusch (*Ibid.*, t. XII., p. 232) who describes it as a steatoma, succeeded in removing so as to cure his patient, was evidently also of a lipomatous character. M. Benedict, (*Bull. de Férussac*, t. I., p. 239,) in fact relates, that he

extirpated from the thigh a fatty tumor, caused by a fire-arm, and in which he found some pieces of money ! In 1838, I removed from the outer and lower part of the thigh, in a woman 40 years of age, a fatty tumor of the size of the head ! This lipoma, which had existed for years, and which might have been taken for an encephaloid tumor, required an incision of ten inches in length in the direction of the vastus externus muscle, and another much shorter, transversely in the direction of the ham. The dissection discovered to us, that this mass, in place of penetrating beneath the aponeurosis in the ham, had simply depressed the fascia lata in the direction of the gastrocnemii muscles between the tendons of the biceps and semi-tendinosus, and then in the external supra-condyloid groove of the knee. No accident supervened, and the cure, which has remained perfect up to the present time, (January, 1838,) confirms what the dissection moreover had authorized us to believe, that the tumor in question was a lipoma, and not a cerebriiform tumor.

### § VIII.

Also it is the same with lipomas of the thigh and leg, as with lipomas in every other region of the body ; whatever may be their volume, their extirpation is generally attended with but little danger when they do not go beyond the depth of the sub-cutaneous layer. It is no longer so however, when their root is situated among the muscles. In such cases the patient cannot be relieved of them but by means of a dangerous operation ; the more so as fatty tumors of this description readily acquire a very large size. There was one of this kind at the hospital of Saint-Louis, in 1837, the size of which was equal to two adult heads. In a patient mentioned by M. Klein, (*Graefe und Walther Journ.*, vol. I. p. 112,) the lipoma reached from the breech to the ham, and weighed near 28 pounds. A woman who was admitted into the hospital of La Charité in 1836 had a similar tumor in the same region ; and in 1837 I operated for another which weighed 32 pounds in a man from the country, who had also a lipoma of the size of a child's head in the dorsal region. Fatty tumors therefore constitute in this region an extremely serious disease. Originating among the muscles, in the midst of pliant tissues, they ordinarily acquire great dimensions in their vertical diameter, before becoming prominent under the skin. In the woman I have spoken of, the tumor, which descended down to between the gastrocnemii muscles, and ascended nearly as high as the attachment of the gluteus maximus, and had extensively separated the muscles and vessels, and was eighteen inches long and eight to ten in thickness, nevertheless weighed only from eight to nine pounds. The one I removed in 1837, and which occupied precisely the same region, ascended about five inches higher than the first and descended only to three or four inches below the knee. Though it weighed 32 pounds and was of enormous volume, as the cast of it in wax which was deposited in the museum of the Faculty shows, yet it had not deformed the substance of the thigh to a much greater depth than that of which I have just spoken. The patient operated upon by M. Klein and in whom the tumor singularly resembled in its situation, nature and weight, that of



the patient on whom I myself operated, died on the ninth day, while mine succumbed on the eighth. The woman, on the contrary, whom I have mentioned first, ultimately recovered; when at the end of three months and after having experienced several attacks of erysipelas, she left the hospital, she continued to walk for a long time in the wards, and the wound had completely cicatrized. When called upon to such tumors, the surgeon ought to put to himself a number of questions. Knowing that the patient cannot be relieved of the difficulty without endangering loss of life, he ought first to ask himself if it is proper to meddle with the case. Should the tumor incommode only by its weight and volume, and had not undergone any degeneration, and had developed itself very slowly and made no further progress, perhaps it would be more prudent to respect it especially in a person in advanced age or dyspeptic (cacochyme.) In the contrary case we have no resource but extirpation of the tumor or amputation of the limb, as the dimensions of the pedicle no longer admit of the employment of the ligature and as caustics are inadmissible in any case. Amputation of the thigh for a lipoma has something in it strange and repugnant. It is true that in order to remove these enormous tumors, we may be obliged to divide a certain number of the posterior muscles of this part of the limb; that the continuity of the femoral vessels and of the sciatic nerve, run some risk of being implicated, and that in every case we are more or less compelled to create an enormous wound, whose suppuration is necessarily exceedingly dangerous. But besides that most of the muscles, from being simply spread out or widened apart, may if necessary be avoided, the lobes of the lipomatous tumors are ordinarily sufficiently movable to allow of their being readily enucleated from the periphery of the vessels and nerves. Moreover, the division of the femoral artery or sciatic nerve, would it necessarily result in gangrene and death? It is not to be forgotten that amputation in such cases is to be performed either in the articulation itself or very near the great trochanter, and that besides the slight prospect of success it presents, there would nevertheless, even under the most favorable circumstances possible, be thereby produced an immense amount of mutilation; while the pure and simple extirpation of the tumor, which in the aggregate would not be more dangerous than the extirpation of the limb, would at least have the advantage, should it succeed, of effectually curing the patient. I would not therefore prefer amputation of the thigh to extirpation of the tumor, unless it should be found impossible to operate without wounding at the same time the crural artery and nerve as well as the sciatic nerve. Of the two patients I operated upon, one it is true died, but he had been exhausted by long-suffering and was near sixty years of age; the other however recovered, though the dissection in her during the operation had been almost as extensive as in the other.

The extirpation of these lipomas, however, in this region, is more frightful or dangerous than really difficult: to accomplish it I adopted two different modes. In the first case I made an incision which went directly down to the adipose tissue, and extended from the tuberosity of the ischium along the semi-tendinosus muscle as far down as below the ham. Transforming this first into a T incision, I

divided the tissues outwardly as far as to the external side of the triceps muscle. Having reversed the two flaps of the T, I had only to divide the two thirds of the long portion of the biceps. Then dissecting the tumor with free strokes of the instrument, I detached it first on its outer side, then inwards and then from above downwards, either by means of the bistoury, or with the fingers or the handle of the scalpel, completing the extirpation in less than five minutes. In the second patient the mass was so immense, and furrowed by veins so numerous and so enlarged, that I deemed it proper to remove with it a large ellipse of integuments. I was obliged in this manner to include in the incision a portion of the biceps muscle, and of the semi-tendinosus, semi-membranosus and gracilis muscles, which were broadly spread out in the manner of a membrane, upon the surface of the lipoma. Having detached this gigantic tumor from the external parts of the leg and thigh, I tore out a lobe from it from below the breech, and then a second from the hollow of the ham; but from its having enveloped the vessels in its extension inwards, the dissection on this part became difficult and laborious. The great anastomosing artery, which I could not avoid at the distance of two lines only from the trunk of the crural, made me fear at first that I had wounded this last. The isolation of the sciatic nerve also was not unattended with difficulty. The operation nevertheless, notwithstanding the rupture of two or three putrescent (putrilagineuses) cavities which I had to empty as I proceeded was neither very long nor very laborious; it did not last over a quarter of an hour. In neither case did the approximation of the lips of the wound present any difficulty. But for the attacks of erysipelas and some menaces of purulent infection which supervened in the woman operated upon in 1836, accidents which may be developed after an operation of the least serious nature, the cure certainly would not have required more than five or six weeks to be accomplished. In the man who perished, and upon whom I did not operate until after having taken the advice of MM. Ribes, Larrey, Marjolin, Sanson, Laugier, Bérard the elder, Bérard the younger, Monod, Robert and all the other distinguished surgeons of Paris, death appeared to have been the result of defect of reaction, and as it were exhaustion of the vital principle. These operations, however, up to the present time have not been performed sufficiently often, to enable us to appreciate with exactitude their value or their danger.

#### § IX.

I would remark in conclusion, that lipomas, like lymphatic tumors and neuromas, are so easily detached from the surrounding tissues, that enucleation is applicable to them, and ought to be substituted to the employment of the bistoury, wherever there would be danger of wounding the large vessels or important nerves. Being situated independently, and as it were without any organic attachment, in the midst of the tissues, they may moreover be torn out without fear by means of the finger or any other mode. They are the kind of tumors in fine whose extirpation, all other things being equal, involves the fewest dangers, and presents the best chances for success

together with the greatest degree of facility and simplicity in the operative manual.

[*Fatty Tumors*.—Our countryman, Dr. Parker, a missionary in China, has had much practical experience in a peculiar form of enormous *cutaneous or fatty tumors*, which he has seen or operated for successfully during his philanthropic labors. In a recent memoir of his, published in Cormack's *Monthly Journal of Med. Science*, (June, 1846, p. 393, &c.) he mentions one in a beggar aged 35 on the right side of his face, and which increased in ten years to two and a half feet in circumference. Dr. Parker extirpated it without difficulty by two elliptical incisions, each eighteen inches long. It weighed near nine pounds, and was of glandular structure, with a few cells containing a yellow or dark fluid, and was in part cartilaginous. A slight paralysis only was left from the division of the portio dura. The patient recovered so well in three weeks as to perform the duties of porter to the missionary hospital. These excessive growths of a lipomatous or with mixed cartilaginous and encysted organization, and which in some cases have been seen by Dr. Parker (according to the paintings he exhibited at New York,) to extend *like wings* from the whole posterior portion of the trunk and lower limb on one side, appear to be the result of the excessive indulgence or gluttony in the Chinese for farinaceous and other non-nitrogenized kinds of food, that favor fatty growths and accumulations. See note on Mr. McIlvalne's views on this subject, Vol. II.]

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## CHAPTER VI.

### ELEPHANTINE TUMORS.

The class of elephantine tumors, very common in Africa, the Indies, and many countries of Asia and America, but rare in Europe, and especially in France, are met with only as an exception in other than the genital organs either of men or women. Being caused by an hypertrophy, together with degenerescence of the integuments, or cellular tissue, and sometimes of the aponeuroses and muscles, they may acquire a development still more considerable than lipomas. I have seen instances of them upon the nose, ears, feet and hands, and some other regions of the body. In 1836, at the hospital of La Charité, a woman was brought to me, of about forty years of age, who had the hand, fore-arm and elbow three times their natural size, in consequence of a degenerescence of this kind, and in whom the upper half of the arm, as well as all the other parts of the body were in a perfectly sound condition; so that the disease had become suddenly arrested at the distance of two or three inches above the humero-cubital articulation. A man in whom I extirpated the limb at the articulation, and to whose case I have elsewhere alluded, had upon his right arm a similar degenerescence, which extended from the extremities of the fingers to the shoulder, and ultimately became



complicated with a cancerous or colloid transformation at the centre of the humerus. I have met with many instances of persons who had in this manner the foot and the leg, either partially or wholly enlarged to double, triple, or even quadruple their natural size. In one of these patients the elephantine tumor abruptly terminated in the form of an enormous lardaceous collar, at some inches below the knee. In the greater part of them the disease imperceptibly disappeared above, and in all of them the limb truly exhibited the appearance of the leg of an elephant. Should the tumor be accurately defined, as in the case of those I have been describing, and should it have been of long standing and have resisted all the means indicated by a judicious therapeutic, we may, should the person be in other respects in good health, propose its removal. But in such cases it is amputation of the limb itself only, which presents any chances of success, or that can be had recourse to. In all cases, on the contrary, where the elephantine degeneration shall appear to be imperfectly limited or prolonged under the form of indurated plates or radiations beyond the tumor itself, properly so called; or complicated with plates or projections of a similar nature, on other parts of the body; or we have reason to suspect the slightest alteration in the viscera; or that the health of the patient has been profoundly deteriorated, we must be cautious not to meddle with it, or confine ourselves to palliatives. I shall, however, return to these tumors in speaking of operations performed on each region of the body, in particular, and especially upon the scrotum or vulva. The tumors called keloid, (keloides) which I have seen in the form of a firm, reddish-colored lardaceous plate, four to six lines in thickness, and two inches in breadth, upon the shoulder of a young lady, who had already been operated upon for it, by M. Forget; which I have met with also, under the angle of the scapula, in the dorsal region of another female; and which M. Warren, (*on Tumors*, etc., p. 45, pl. 3,) who has described them, appears also to have observed on the shoulder; should be destroyed by means of the zinc paste, or extirpated with the same precautions as if they were of the character of an erectile or elephantine tumor. Extirpation would be applicable only to the *eloid* (eloides) tumors described by the same author (*Ibid.*, p. 48, pl. 4), and which show themselves under the form of a bunch of agglomerated enormous-sized leeches, or of a small intestine coiled up upon a circumscribed point of the skin.

[M. Colson, of Noyon (France), describes (see *Journ. des Connaiss.* &c., de Paris, Mai, 1842, p. 189 et seq.) a remarkable case of African elephantiasis in a woman who died at the age of 53, after fifty years of suffering from that and the antecedent diseases which appear to have led to its production. The privations of poverty, impoverished diet and constant residence in a marshy situation (commune of Salency) predisposed doubtless to this train of maladies, which commenced in infancy after small pox with a large tumor on the right side of the vulva, which after some years' continuance was destroyed by an empiric by means of caustic. The right side of the abdomen and thigh however began to swell before her catamenia appeared, when another empiric attacked these parts with the cautery and caustics, applying these remedies both above and below the

knee, the last of which caused erysipelas and gangrene of the leg, and denudation of the tibia. This last wound partially recovered, but continued an open, discharging ulcer for many years—the hypertrophy of the thigh also gradually increasing. Worms were engendered in these foul ulcers. At the age of 38 this wound healed, and ulcers were established at the malleoli. The menses were most of the time regular, but the urine was occasionally suppressed, which latter difficulty was relieved by nitrate of potash drinks, bringing on copious evacuations of this secretion, which sometimes had a milky appearance. The thigh at the middle part was over thirty-seven inches in circumference, covered on the posterior part, as was also the dorsum of the foot, with thick, offensive incrustations, also in various parts with tubercles (as is common in tropical elephantiasis), while the leg of the diseased limb was also hypertrophied in its lower part to the dimensions of over twenty-one inches in circumference, having enormous red vegetations about the ankles—the whole limb being at least three times the size of the other. It retained to some extent the powers of flexion and extension. T.

## CHAPTER VII.

### HEMATIC TUMORS.

A kind of tumors whose pathology might constitute several species, and which had scarcely been noticed before I described them in 1826, and afterwards in 1833, are those which are caused by effusions of blood. These tumors which have a predilection for the synovial bursæ, and which sometimes form for themselves cysts in the cellular tissue, are either solid, fluid, or semi-fluid, or sometimes constituted of a melange of concrete clots with matters that are altogether of a fluid nature. I shall, when speaking of cysts (kystes), return to those which contain rather fluid than concrete matters; at present I shall confine myself to solid hematic tumors. These tumors perhaps are more common than would at first be thought. I have elsewhere remarked (*Traité des Contusions*, Paris, 1833), that certain polypi of the uterus, some tumors of the prostate, with steatomas of the head, breast, &c., often appeared to me to owe their origin to an effusion of blood or fibrinous concretion, and numerous facts have since confirmed me in this opinion. This much, however, is certain, that most of the tumors described under the title of steatoma or lipoma, and which do not belong to the order of fatty tumors, enter into the category of hematic tumors. The tumor of 188 grammes in weight, which a patient carried for the space of twenty years upon the right side of his head, under the denomination of a lipoma, and which was successfully extirpated by M. D. Lasserre (*Cas de Chir.*, pp. 21, 22, 23, Perigueux, 1833) was to all appearance nothing more than a degenerate hematic tumor. The same was the case as I should think, with another tumor of the size of an egg, situated below the mamma to the left on the thorax of a man, and

which the same practitioner removed; also with that which existed upon the shoulder and which he also extirpated; the same with a cyst filled with matter resembling boiled rice and situated upon the left cheek of a man; and with the cyst still larger, which a woman had on her knee, together with some other tumors, for which M. D. Lasserre in like manner operated. Hematic tumors differ from lipomas in general, in this, that they are scarcely ever pediculated; that they rarely exceed the size of an egg, the fist or the head; that they are almost constantly surrounded with an irregular cyst when they are situated in the cellular tissue, but sufficiently regular, on the contrary, when they are formed in the bursæ mucosæ or the synovial cavities; in this also, that the matter of which they are composed, is either clotty or fibrinous or fibrous, and of a variable color, yellowish, gray, sandy (rousse) or brownish; and that serous or synovial matter is frequently found mingled with it. Like lipomas, hematic tumors do not usually cause any pain, and incommode in reality only by their volume or weight. Like lipomas also, and perhaps more frequently than them, they appear to be susceptible of degenerating and undergoing transformations of a bad character. No topical application or internal medication can destroy them when they are of old date or have acquired a certain volume. Caustics, the ligature and extirpation, therefore, are the only remedies we have at our command.

#### ARTICLE I.—HEMATIC TUMORS IN GENERAL.

##### § I.

*Plasters*, liquids and all kinds of discutient (fondants) topical applications, by which we sometimes succeed in obtaining resolution of sanguineous deposits, have no longer any efficacy when we have under treatment an ancient hematic concrete tumor. These means, eulogized by M. Champion, as irritating injections have been by M. Asselin, (*Considérations sur les Bourses Muqueuses*, Strasbourg, 1803,) possess in reality no value except in recent hematic tumors.

##### § II.

*Caustics*, besides their inconvenience of destroying integuments which it might be advantageous to preserve, would also be attended with the objection of exacting a considerable space of time, and of failing in the majority of cases. A surgeon mentioned by Lombard, (*Opuscules de Chirurgie*, p. 108, 1786,) who wished to destroy at every possible hazard a tumor evidently hematic, in front of the knee, by means of caustics, could not effect his object, but caused by this means several abscesses in the neighborhood of the patella. At most, therefore, escharotics under such circumstances, could only be employed in association with the ligature, as was practised by F. Aquapendente and has been since done by Chopart and Sabatier; or in the case of those persons who peremptorily refuse every other kind of operation.



## § III.

The *ligature* upon hematic tumors is still more uncertain than for lipomas. As these tumors almost always present a very large base, and have besides a more or less distinct cyst, they are badly adapted to constrictive means, and do not find in such resources their best remedy.

## § IV.

It is to *extirpation* therefore that we must have recourse, if we wish to relieve the patient. The question might then be asked, if it would not be sufficient to lay open and empty the cyst? To this first question we may reply, that the simple incision, which would doubtless sometimes succeed, would most frequently prove unsuccessful, expose to more accidents than extirpation, and render the remainder of the operation obviously more difficult. If Paroisse (*Opuscules de Chir.* etc., p. 94, 1806,) was enabled to extract a cyst of this kind by a simple incision, it was because inflammation, excited in the cyst by an irritating injection, had previously isolated it from the surrounding tissues. All that we can demand in such cases is, to know if it is indispensable to carry away the totality of the cyst with the tumor, or limit ourselves to the excision of the latter. Saint Christeau, (*La Chirurgie Pratique*, p. 180, 1697,) having restricted himself to emptying a steatoma of the size of the fist, which was situated upon the inner side of the thigh, found himself obliged to scarify the internal surface of the sac, and to dress the cavity with an exciting digestive before he could effect its cicatrization.

## § V.

*Excision*, properly so called, is of such doubtful efficacy, that J. Fabrice, (*Œuvr. Compl.*, partie 2, p. 620,) was already aware of it, and in his time recommends that we should divide the vessel which nourishes the remains of the cyst. This mode, however, has been since lauded, first by Chopart and also by Louis, or by Percy, (*Dict. des Sc. Méd.*, t. XXVII., p. 44, 45,) but it is to Mosnier, (*Thèse*, Paris, an XI.) and to Bourdet, (*Essais sur les Loupes*, p. 23,) that it is specially indebted for having been rescued from oblivion, and been made to assume a kind of celebrity at the commencement of the present century. Mosnier pretends that after this operation, the bottom of the wound is transformed into cicatrices, and takes the place of integuments. The facts, nevertheless, advanced by those observers, and which are applicable at most to certain regions of the body, have not been of a character to convince any one, or to be received as laws, and extirpation, properly so called, has continued to be generally preferred. Perhaps, however, we have gone too far in this respect, and that it would answer the purpose when the posterior wall of the cyst cannot be dissected without too much difficulty, that it should be left in its place and made to suppurate. We cannot see, in fact, and practice is nearly silent on this subject, why, after suppuration, the walls of a wound of this kind ought to have so much difficulty in agglutinating. Only in this case I would not recommend that the integuments should be removed with the tumor ;

at least we should preserve a sufficiency of them to enable us to cover the bottom of the wound. It is nevertheless true that this practice must be considered as an exception, and that unless there are particular objections, the extirpation of the entire hematic pouch ought to have the preference. The *operative process* also is sufficiently simple. If the tumor is very voluminous, we remove with it an ellipse or a star of the integuments. In the contrary case, we lay it bare by means of the simple incision, that of the T, or the crucial. Perhaps, in such cases, the semilunar would be preferable. The tumor being concrete, enables us to isolate its envelopes without fear, and at the same time to reverse the entire sub-cutaneous layer. This first dissection being terminated, an assistant is charged with holding the flaps of the integuments apart and of making traction upon the tumor in the proper direction, while the surgeon detaches and carefully isolates it with the strokes of his bistoury from the deep-seated parts. As the hematic tumors, which may be extirpated in this way, are almost always sub-cutaneous, their extirpation is scarcely ever accompanied with serious hemorrhage. There are therefore generally but a small number of ligatures to place or arteries to tie. If the totality of the cyst has been destroyed, and the wound reposes every where on pliant vascular tissues, and the flaps have been cut of proper shape, there is a prospect of success by immediate reunion, and it ought to be attempted. Under opposite circumstances it is better to dress at first with the balls of lint, over which the flaps are to be brought, and which in their turn are to be covered with a perforated linen, plumasseaux, compresses and the simple containing bandage, until the wound has become completely cleansed and the flaps undergone all their retraction. By this means we avoid the danger of nervous accidents, purulent collections, and erysipelas, but we must be prepared to find the wound cicatrize slowly, and the patient not thoroughly cured until after the expiration of one or two months.

## ARTICLE II.—HEMATIC TUMORS IN PARTICULAR.

Hematic tumors may develop themselves upon all the regions of the body. It is rare however, except in the superficial or deep-seated mucous bursæ, that they are distinguished, as respects the operation, from lymphatic tumors or neuromas, since everywhere else their extirpation is subjected to the same rules for the operative process that those last named tumors are.

### § I.

Were it necessary to describe the process for extirpating hematic tumors in all those regions where synovial bursæ exist, I should have to examine those of the temporo-maxillary region, chin, angle of the jaw, the thyroid angle, spinous process of the seventh vertebra, the dorsal and lumbar region, that of the ribs and sternum, the lower angle of the scapula, the acromion, inner condyle of the humerus, the radius, ulna, metacarpo-phalangeal angles, both dorsal and palmar, the phalangeal articulations, the spine of the ilium, the great trochanter, condyles of the femur, spine of the tibia, head of the fibula, the malleoli, heel, tarsus, first and fifth bones of the metatarsus, club

feet, those with feet amputated, who are humpbacked &c.; but there are in reality no others but that of the knee and perhaps that of the malleoli, which require in this respect particular mention.

## § II.

I have in three instances extirpated hematic tumors which were situated in the mucous bursæ of the *malleoli*, in that of the outer ankle in two cases, and in that of the inner in the third. In such cases, if it is the external malleolus, we must be on our guard against opening into the sheath of the tendons of the peroneus longus and brevis muscles behind, and wounding the synovial cavity of the tibio-tarsal articulation below. The danger also of purulent inflammation in a region of this description, ought to deter us here from attempting union by the first intention, if the state of the wound or nature of the flaps do not appear to be favorable to it. At the internal malleolus we must be on our guard against wounding the sheath of the tibialis anticus muscle and the posterior tibial artery behind, and the articulation and the sheath of the tibialis anticus muscle below and in front.

## § III.—Hematic Tumors of the Knee.

In no place are the tumors of which I am speaking more frequently encountered than about the knee, and especially in front of the patella; nor is there any region perhaps, where their extirpation exposes to as much danger. A tumor of the size of two fists, which was situated upon the left knee, and which M. Hip. Larrey (*Gaz. Méd.*, 1835, p. 712,) gives as an example of hematic tumor, was extirpated at the Hospital of Val-de-Grâce. The officer who was the subject of it was soon seized with general accidents and with delirium, followed by death on the eighth day. Two patients operated upon for simple tumors, one by M. Roux, the other by myself in 1825, at the hospital of Perfectionnement, died in the same way and in as short a space of time. M. Hervez de Chegoin (*Journ. Hebd. Univ.*, t. III., p. 329,) who still gives the name of *lipoma* to these tumors, and who confesses that he does not comprehend their character, has sometimes practised their extirpation with success, but he is far from dissembling also the gravity of the operation. Extirpation performed by M. Warren (*on Tumors*, etc. p. 40) for a cancerous tumor in front of the patella, was also followed by death. It is sufficiently remarkable also that death in these cases should have resulted from cerebral phenomena and ataxic symptoms, which are scarcely explicable by the local accidents occasioned by the wound itself. I hasten to add, however, that in the great majority of cases, the operation is not followed by any unpleasant symptoms, but most usually in fact, effects a complete and sufficiently rapid cure. Six of the patients whom I have treated in this manner recovered perfectly.

*Operative Process.*—The patient is to be placed upon his back and his leg maintained in a moderate state of extension; one assistant takes charge of the foot and the other of the thigh. If the tumor has but little volume, the surgeon lays it bare by means of a longitudinal incision. In the contrary case, and where the skin is to be



preserved entire, I prefer the semilunar incision, taking care to turn its free border outwards. If the simple incision has been used, its two lips are dissected in succession, and reversed as far as to the borders of the patella. With the semilunar incision we carefully detach the flap of the integuments from without inwardly, and in such manner as to reverse it upon its base upon the inner side of the knee.

If on account of any particular reasons, we should consider ourselves obliged to give the preference to the crucial incision, we must detach and reverse its four flaps upon their base, with the same care. The same remark applies to the elliptical or to the stellated incision, with this difference only, that we should here leave a portion of integument on the apex of the tumor. In whatever manner performed, the tegumentary envelopes having been turned back, we proceed to the isolation of the periphery and deep-seated surface of the cyst. All the precautions required for this dissection, have reference to the articulation of the knee and to the diseased cyst itself, there being no large sized artery or nerve found in the neighborhood. We must therefore not forget that upon the outside, and both above and below the patella, the synovial cavity might be readily opened, and that the same remark applies to the inner side; but that directly in front there is nothing in this respect to be apprehended. In no other region also do hematic tumors exact more attention in regard to the extirpation of their cyst. However little there may remain of its posterior wall at the bottom of the wound, this cyst retards and even prevents cicatrization, and keeps up a suppuration whose consequences are not always devoid of danger. A patient whom I found at the hospital of Saint Antoine in 1828, and whom Beauchêne had operated upon two months before, retained a large purulent cavity in front of the knee. The posterior wall of the cyst left at the bottom of wound, had taken on all the characters of fibro-mucous lamellæ of a new formation, and exhibited no disposition to improve (*à la mondification*). I adopted the plan of removing it by a careful dissection, and from that moment the wound cicatrized regularly and without any difficulty. It is necessary therefore, in these extirpations, to follow exactly the line which separates the natural tissues from the thick envelope of the tumor. Should some shreds of the cyst have at first escaped from under the bistoury, we must immediately after seize them with a double erigne or claw-forceps, (see Vol. I.) and extract them before terminating the operation. The dressing also deserves some attention. The flaps having no other support to rest upon than osseous or fibrous planes, or tissues that are but little vascular, and being moreover usually very thin, should not be brought over and maintained upon the wound except by means of a very moderate degree of traction and compression. All the pieces of dressing also which are to cover them, should be sufficiently pliant, and so lightly adjusted that no strangulation may be produced either in the direction of the leg or thigh. The leg also, by placing a thin cushion under the ham, should be kept in a state of gentle flexion rather than in complete extension. At the first sign of inflammation also, it would become imperative to envelop the knee in compresses or emollient cataplasms, and to cover it with leeches and renounce every attempt at immediate union. At

a later period, and when the borders of the wound have become agglutinated and united to the subjacent tissue, but are at some distance apart, it may on the other hand become useful to place the leg in extension, and to maintain it in that manner by means of an immovable dressing. Unless that is done, the slightest flexion of the knee brings the patella between the lips of the wound in the manner of a wedge, and may retard the cure to an indefinite period.

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## CHAPTER VIII.

### CYSTS (Kystes) PROPERLY SO CALLED.

Cysts form one of the most numerous class of tumors, and have among them a sufficient number of varieties. Besides the purulent, hematic and synovial cysts, there are the melicerous, atheromatous, steatomatous and hydatid, and such as are purely serous, all of which sometimes reclaim the aid of surgery.

#### ARTICLE I.—SEBACEOUS CYSTS.

Quite a numerous order of cysts are those that are formed at the expense of the follicles of the skin. The tumors which result from them and which are generally known under the name of *maggots* (tannes, or *worms*) and *meliceris*, receive also other appellations when they exist in the form of pimples (boutons), rugosities or simple tubercles. They are frequently observed upon the scrotum and skin of the penis, and not exceeding in size a pin's head, yet susceptible of being made to yield by pressure a clot of sebaceous matter. On the face these little tumors when they inflame are called red pimples (couperose), causing very small abscesses, which are also relieved by strong pressure, after having perforated their apex with the point of a pin. But it is not with small cysts of this description that operative surgery has any particular connection. When the sebaceous matter is accumulated in greater quantity in the crypts, it distends and enlarges them to such degree as to produce tumors, whose dimensions vary from that of a pea to that of a pullet's egg. These tumors, which usually do not cause any pain, which are unattended with any inflammatory action or change in the color of the skin, and which possess a great regularity in their form, are soft (mollasses), slightly fungous and as it were semi-fluctuating. The cranium, face and neck are their most favorite localities. They are noticed also on other regions of the body. I have met with one upon the shoulder of the size of a pullet's egg; and also encountered them on the legs, thighs and fore-arms. Even the fingers themselves may be the seat of these tumors. A man in the country, whom I knew in my childhood, had upon the dorsal surface of the middle articulation of the left middle finger, one of these tumors which was of the size of a very large nut, in such manner as to form there an enormous mass which projected posteriorly. A patient of M. Fisher operated upon

by M. Warren (*on Tumors, &c.*, p. 529, pl. 16.) had one of a most singular description in front of the great trochanter. Some patients have several at the same time, and this peculiarity is principally seen where the sebaceous cysts are of but little size. It is proper however to say, that I have met with many of the largest kind at the same time upon the same individual

The following case perhaps also belongs to tumors of this description. An officer of health in the environs of Paris, a robust man aged 55 years, had for many years in the right supra-hyoid and parotid region, a tumor which ascended as high up as upon a line with the cheek bone and the labial opening of the mouth on the outer side of the jaw. This tumor, which when I had an opportunity of observing it in the spring of 1838, had already undergone various degrees of transformation, so much resembled an osteo-sarcoma that many experienced practitioners of the capital had characterized it as such; its extension towards the larynx below and the pharynx behind and in the direction of the mouth, had even precluded all idea of an operation, and confined the recommendations to the palliative treatment for cancerous affections. Under the impression that I recognized something fluctuating in its most prominent lumps (*bosselures*), and that there was also a certain mobility in the tumor, and that it presented neither the positive characters of cancer or evidence of actual adhesions with the maxillary bone, I considered it proper to lay it open freely upon one portion of it. I was enabled thereby to extract from it several ounces of a matter either melicerous, grumulous or semi-purulent, which resembled neither fibrine, pus nor tuberculous matter, nor fat or gelatine, nor the substance known as encephaloid, colloid or melanotic (*mélanique*), and which had in a word no analogy with any of the substances which are usually found in cysts.

Sebaceous matter was the only substance to which one could possibly in some respects compare it, that is to say, that this substance, unctuous in some portions of it and friable, and as it were desiccated in others, had for its receptacle a cavity whose walls singularly resembled in their papillar (*pointillé*) or cutaneous aspect that of melicerous cysts. Anxious to know what course to pursue, and wishing moreover not to influence his judgment, I confided a portion of this material to M. Donné that he might submit it to the microscope and certain chemical reagents, without having informed him of the intention I had in view. This physician, at the expiration of two days informed me, that he had found nothing but fatty matter and *particles* (*paillettes*) of *epiderm*, in the substance which I had transmitted to him, and consequently it could come only from a disease of the epiderm or of the follicles of the skin. Am I then right in concluding that the tumor in question was in reality of the description of that known as a maggot (*tanne*) and proceeding from a sebaceous cyst? Adopting the affirmative, I will add at the present time, that these cysts in breaking up (*se décomposant*) may undergo transformation of a bad character; for a patient whom I have since exhibited at the Clinique and who had a tumor of the same kind more advanced, and in the same region, was ultimately attacked with a legitimate cancer of the lower jaw. Be this as it may, melicerous cysts rebel against



all resources except those of operative surgery. When they have acquired a certain volume and remain in the chronic state, we may by compressing them upon their sides, or by dilating the little spot or black-colored hole (*pertuis*) which we generally succeed in finding on some one of the points of their periphery, and which is as it were their outlet, empty them and effect the discharge of matter resembling worms; but they are not cured by these means. The sac soon after fills up, and the tumor is not long in re-acquiring its primitive volume. It is from proceeding in this manner, that some have been induced to believe that the disease actually consisted of worms coiled up underneath the skin. The small black point which gets out first, is taken for the head of the worm, and the sebaceous matter which threads out in an undulating line as it comes through the cutaneous aperture, completes the illusion. This has proceeded to such extent, that having presented for examination, a thread of this kind of two inches in length which I had just extracted from a maggot ulcerated below the left breast of an adult man, the interne at first and the physician afterwards, assured me it was an entozootic worm and were preparing to designate its species, when I disabused them of their delusion. Topical applications, whatever be their nature, have no influence upon this kind of worm. The merely laying them open, or exciting inflammation in them by means of a seton, acupuncture, or needles or threads passed through them, does not hinder them from being reproduced. Even their excision in certain cases does not always cure the patient. They must either be extirpated completely, or after having emptied them by a large opening, carefully cauterized throughout their whole interior. The director of one of our royal theatres, had in front of the left temple a sebaceous cyst of the size of a large bean. As he did not wish to submit to any sort of bloody operation, I confined myself at first to the evacuation of the melicerous matter by enlarging a little the opening of the tumor. The latter having returned, I laid it open with a cut of the lancet and voided it again. But it again returned, and the patient at length consented to have it extirpated.

A physician who was a member of the Royal Academy of Medicine, had at the upper and posterior part of the right orbital angle, a sebaceous cyst of an inch in diameter. It was frequently laid open in order to empty it, but the tumor invariably reappeared; he decided upon having its whole cavity cauterized, and was thus cured. In the patient who had one of these cysts on the top of his shoulder, I excised all the projecting portion of it and touched the remainder with nitrate of silver. Hardly any inflammation ensued; the epidemic portion at the bottom of the wound sloughed off at the expiration of eight days; the borders of the wound were not approximated, and it was the preserved portion of the sebaceous cavity which served the place of the cicatrices, and assumed the appearance and most of the characters of cutaneous tissues. In conclusion, therefore, should the cyst not be of large size, the best plan is, after having circumscribed it in an ellipse by two semilunar incisions, to seize it with an erigne and extirpate it. If the approximation of the borders of the wound and immediate reunion should be interfered with by this mode of excision, we should commence with a straight incision, whose lips

should then be dissected and carefully separated on each side, leaving intact the tumor, which should be secured with a hook, and afterwards extirpated. By this mode the operation is longer, more difficult and more painful; besides which, notwithstanding all our precautions, we most usually cut into the cyst before having completed the dissection, because the thickness of its walls can scarcely ever be correctly ascertained beforehand, and moreover, are frequently found intimately blended with the skin.

A child three years of age, had upon the right external orbital angle and in front of the temporal fossa, a sebaceous cyst of an inch in diameter. As there was a dread of any kind of cicatrix, I laid it bare by means of a simple incision. I had already isolated two thirds of it, when a movement of the little patient caused me to cut into it in front. The tractions which I was constantly obliged to make upon it to get it out, had soon emptied it, and I perceived on terminating, that there was about a centime of it in breadth left at the bottom of the wound. I touched this portion of it freely with nitrate of silver, and the cure was effected perfectly. The wife of a distinguished magistrate of Paris had under her left ear, a sebaceous cyst, slightly elongated in shape, and of the size of a nut. Desirous of avoiding the slightest trace of a wound at this part, and at the same time to make the operation sure and prompt, I commenced by seizing the tumor with an erigne, which I confided to M. Prus, the physician the family, while M. Vasseur who also acted as my assistant, stretched the integuments. By means of two incisions slightly incurvated, I circumscribed a very long ellipse of integuments, which I removed with the tumor, and which enabled me readily to enucleate the latter in front and behind, and then from above downwards, by means of the bistoury. The lips of the wound were easily approximated and the cure completed in three days without any suppuration. If on the contrary the tumor should be very large, it would be better to lay it open freely, empty it with care, and then thoroughly cauterize its whole cavity. The same process also would be suitable for cysts that are less voluminous, if there were no great danger of a cicatrix slightly deformed. Finally, the excision, or rather the amputation of the tumor, together with cauterization of its deep-seated wall, would be applicable for those which have a large base, and which cannot be extirpated entire, or which we do not wish to submit to a simple incision aided by caustic. Upon the whole, we cannot cure sebaceous cysts but by extirpating them completely, or after having excised them, making use of their deep-seated wall as a portion of integument to serve as the cicatrix. As these are a kind of tumors, however, developed in the substance of the dermoid tissue, or in the appendices and cul-de-sacs of the skin, the operations employed for them are attended with very little danger, and rarely compromise the life. Owing to their superficial position it is next to impossible in operating upon them, to wound either arteries, veins, nerves, or any important organ. As these operations, except we extirpate, do not oblige us to go as deep as the sub-cutaneous fascia, it must be only in very rare cases that they can give rise to diffused phlegmon, phlegmonous erysipelas, phlebitis, or purulent infection. Erysipelas properly so called, angioleucite, and the unpleasantness of a cicatrix more or less de-

formed, together with the pain, are the only inconveniences that can occasionally result from them.

[In America, and especially in the West India or tropical portion of it, these diseased sebaceous follicles, wherever the heat of the climate and hot sun are constantly exciting the skin, are very common, and particularly upon the face from its great exposure, and in that part most frequent upon the dorsal surface of the extremity of the nose and upon its alæ. Their enlargement is unquestionably first greatly accelerated by the vulgar practice of squeezing out these so-called worms, so accurately described by our author. Intemperate persons, addicted also to gross indulgences in indigestible food, as crude fruits, fish, &c., and those most exposed to the hot sun in warm climates, as seafaring persons, seem most obnoxious to this hypertrophy. In the remarkable case (to which I find no parallel on record) which I operated upon in Nassau, the capital of the Bahama Islands in the year 1825, and which is inserted below, the cure was complete, and there was no attempt whatever made by me to save any integuments at all, as that was in fact impossible for the great breadth of base of each tumor, as is seen in the accurate accompanying sketches taken from life by myself. The diseased parts, however, were carefully and thoroughly shaved off *en dedolant* with the bistoury, while raised up with the forefinger in the nostril, until I reached the cartilages, leaving them in this manner, in fact the whole of the nose from above the limits of the tumor, perfectly *raw*. It is in fact surprising almost, considering the heat of the climate and weather, that gangrene did not take place. The man lived many years with his new and normal shaped nose, was the object of universal remark and reference, and ultimately died of some other disease.

TO DAVID HOSACK, M.D., F.R.S., PROFESSOR IN THE UNIVERSITY OF THE STATE OF NEW YORK.

*New York, Nov. 19, 1825.*

DEAR SIR,—Mr. John Russel, aged 54 years, a planter, of Abaco, one of the Bahama Islands, of robust short stature, and of sanguine temperament, was attacked in the year 1799 with small-pox, from which he recovered after a severe illness. His face remained much pitted, and the surface of the nose was particularly rough. Soon after, there was a perceptible enlargement of the teguments covering the anterior and lateral cartilages of the nose, which increased the more rapidly, as he imagined, from the practice of squeezing out of the end and sides of the nose what are vulgarly called worms, but which are well known to be the secretion of sebaceous glands, indurated and blackened externally by exposure to the air in the orifices of their excretory ducts.

Sir Astley Cooper has expressed an opinion that encysted tumors may arise from obstruction in the glandular follicles of the skin, and this may have been the first cause of the disease. It is not uncommon in the more remote and unfrequented, or what are called *out-islands* in the Bahamas, to meet with fatty tumors of small size and globular shape, upon the teguments of the forehead, nose, and cheek. I have heard them attributed, with plausibility, to the use of salt fish



and crude vegetable food. Nothing however like the gigantic growth of Russel's nose was ever seen in the West Indies, or any where described in the annals of surgery.

This patient came to consult me at Nassau, island of New Providence, about the middle of October, 1824.

For the last twenty years the nose had not varied materially from the extraordinary dimensions and grotesque appearance which the sketch presents in Plate I.

This enormous mass of disease consisted of three lobular tumors, having the appearance of a tribolate pendulous excrescence from the nose.

On examination I found them soft to the feel, and not only pitting, but exuding, on pressure, through minute and almost imperceptible pores, like those of a carbuncle, a thin, glairy, yellowish pus. For years, he informed me, he had been daily in the habit, during the warm weather, of squeezing out through these pores (which are doubtless the original orifices of the diseased sebaceous follicles) a teaspoonful or more of matter occasionally mixed with blood. They were so movable as to be easily turned up upon the forehead, so as to exhibit the openings into the nostrils underneath, which in their natural position, hanging down upon the mouth, they entirely concealed. The middle tumor extended down as far as the lower lip, upon which it rested, interfering very much with drinking and eating, and also with articulation. This, the largest of the three, was about *two inches* in breadth, and, measuring from the anterior to the posterior surface, an *inch and a half* in diameter: the lowest part of it incurvated over the nostrils. The shape was spherical, as also that of the two lateral tumors, which were more globate, and about *one inch* in diameter. Each lateral tumor was seated upon the external surface of the ala of the nose, leaving the rim of the inferior part of the ala in its natural state, but closely adhering to the cartilage above this by a broad base nearly co-extensive with the diameters of the tumors. The middle lobe, however, involved the whole of the tip of the nose, had a larger base and attachment than the lateral lobes, and was more firmly adherent than them to the cartilages upon which it was situated. The middle tumor was also entirely separated on each side from the lateral tumors by a deep fissure, leaving each tumor upon a distinct base. These fissures had been made deeper, he said, by constantly handling and wiping out the clammy matter secreted between the tumors. The teguments upon the diseased part were of the same flushed color and rough appearance as upon the rest of the face.

The remarkable tumors upon the nose of this patient had been familiarly known for years throughout the Bahamas, as well as in many parts of the West India islands; and so extraordinary and unique were they considered, that he was in his travels everywhere proverbially designated by the cognomen of *Big-Nose Russel*. The sneering and sarcastic observations many persons had unfeelingly made upon his misfortune, had for the last ten years, he told me, almost prevented him from going abroad.

There was no pain or irritability on handling the diseased mass, but the weight of it at night was so unpleasant as to inconvenience

his respiration, unless lying on his back ; in which posture, also, the nose interfering with the mouth, would cause him frequently to spring from bed during sleep, with a sense of strangulation. The weight may be imagined from the deep wrinkles upon the forehead and around the eyes, occasioned by the incessant and powerful action of the occipito-frontalis and adjoining muscles, in their effort to sustain the tumors.

After having proposed the operation to the patient, and with much difficulty made him understand that no serious consequences were to be apprehended from it, he went home to Abaco, and in a few weeks returned to Nassau, for the purpose of having it accomplished.

In the meanwhile, the proposition I had made became generally known ; and on his return to Nassau, most of his friends, and one or two practitioners of the place, secretly dissuaded him from it, and told him that an operation of such moment rendered it advisable that he should go to London, and consult Sir Astley Cooper or Mr. Abernethy.

These recommendations, the motives for which, in several of his advisers, it was by no means difficult to interpret, had the effect which was intended ; so much so that when, after he had been at Nassau several weeks, I again suggested the operation, he positively and unequivocally declined. I had almost despaired of again bringing his mind to the resolution of having the deformity removed, until at length, on Tuesday, November 23d, 1824, I succeeded in gaining his entire assent. The operation was performed about noon of that day, in presence of Mr. Brydon, Assistant Surgeon of the Forces at Nassau, in the following manner : passing the scalpel first on the outer edge of the left lateral tumor until it was removed smoothly from the cartilages to which it was attached, then doing the same with the right lateral tumor, and finishing in the same manner, with the middle lobe ; the whole operation being completed *in five minutes*. Several large compresses were then placed over the nose across the face, secured by a bandage round the head, to check the hæmorrhage, which was not more than eight ounces. Openings were made through the compresses to admit light to the eyes. In four days the dressings were removed, and in exactly *two weeks* from the moment of the operation, the wound having (under the carbon, bark, and alcohol poultice, and tonics internally) kindly granulated by the first intention, the patient, to the astonishment of an assembled multitude, who thronged after him, appeared at the public vendue with a *smooth, handsomely formed nose*. The chagrin which this spectacle occasioned to those who had endeavored to defeat the operation, may be much more easily imagined than described.

On passing an incision through the different tumors, they were found to consist entirely of a dense, homogeneous, adipose or fatty substance of a white color, each containing near its centre one or more small spherical cysts of about a quarter of an inch in diameter, filled with a thick, pappy, or a *theromatous* fluid of a yellow color.

Plate II. exhibits the appearance of the face and nose after the cure.

Yours, respectfully,

DR. HOSACK.

P. S. TOWNSEND.

From the account of the case as published by me at New York, 1825, p. 1 to p. 8, inclusive. T.]

Fig. 1.



An exact likeness of Russell's Face and Nose, as taken by P. S. Townsend, M.D., a few days before the operation, which was on Nov. 23d, 1824.

Fig. 2.



An exact likeness of Russell's Face and Nose, as taken by P. S. T., three weeks after the operation.



## ARTICLE II.—HEMATIC CYSTS.

When the unabsorbed extravasations of blood do not give rise to concrete hematic tumors, they become perverted in their nature and result in the formation of cysts which contain sometimes a melange of fibrinous clots and of a more, or less yellowish-colored, red or brown serum, and sometimes concretions which have been designated as free (*libres*, i. e. loose) cartilages, and as hydatid granules and lymphatic productions, which are found floating in the midst of a more or less abundant unctuous, lactescent or diaphanous liquid; so that the whole conveys the idea of grains of barley or rice as seen in a potage, or of cartilaginous or plastic plates or bodies, or laminæ or septa, sometimes free, at other times adherent to the interior of the pouch. Nor is it rare to find the whole contents of the cysts transformed into a homogeneous liquid, sometimes of a reddish color and ropy (*sirupeux*), sometimes milky or rose-colored and of an unctuous feel, or at other times wholly serous or slightly lemon-colored.

§ I.—*Hematic Cysts in general.*

The various kinds of hematic cysts do not differ in any respect as regards the progress, duration or consequences of the tumor, but render certain remedies better adapted to some than to others.

A. Thus cysts that are purely liquid sometimes disappear under the use of *resolvent topical applications*, compresses saturated with a solution of sal ammoniac or iodine, frictions with mercurial ointment and that of hydriodate of potassa. Temporary blistering also succeeds quite frequently.

B. A remedy much more powerful than the preceding, and besides much more simple, consists in incising the cyst on some depending portion of it and emptying it completely. This being done, accurate methodical compression enables us to bring its walls into immediate contact and in this manner sometimes to obtain agglutination by the first intention. Otherwise it suffices to keep the incision open for four or five days by means of a *meche* (tent), that inflammation may be established within the cyst and render its agglutination almost unavoidable.

C. But the best remedy in such cases evidently consists in irritating injections, such as are employed in hydrocele. A puncture with the trochar empties the tumor without difficulty; immediately injecting through the canula of this instrument a certain quantity of tincture of iodine, in the proportion of a third of the tincture to two-thirds of water, I obtain a moderate inflammatory action, which causes but little pain and almost always terminates in the perfect cure of the cyst. Up to the present time I have not found that the tincture of iodine has produced any of those inflammatory accidents and purulent abscesses which some practitioners charge to vinous injections, eulogized, and also employed successfully a long time ago by M. Asselin, (*Thèse sur les Tumeurs des Bourses Muqueuses*, Strasbourg, 1803.) Hematic cysts therefore that are purely liquid, have no need in my opinion of excision, extirpation or caustics, and

the most they can require after resolvent topical remedies, temporary blisters, iodine injections and the simple incision, would be multiplied incisions. The cyst being well circumscribed, allows neither the liquid nor the inflammation, when the latter is moderate, from becoming infiltrated or diffused into the neighboring cellular tissue to such extent as to create the least uneasiness, while the disease may be compared in every respect to a hydrocele.

D. If in place of matters purely liquid, the cyst should contain a variety of the concrete clots which I have mentioned, there might be necessity for operations somewhat more complicated. Then, in fact, it is rare that the irritating injection and puncture, or simple incision, suffice. We might, however, make trial of one or the other of these operations, where the cyst reposes in every portion of it, in the midst of soft tissues. Emptied of the liquid matter it contains, the tumor, if afterwards submitted to compression and the action of discutient applications or temporary blisters, might possibly become concrete and transformed into a nodule that would ultimately disappear by simple resolution. In other cases, and where the cyst assumes most of the characters of synovial tissue, it would be illusory to count on the efficacy of such means.

E. In such cases, massage, also, crushing, and the sub-cutaneous punctures, might be made trial of. The fact is known, that sero-sanguineous liquids, when they once become encysted or enveloped in a sac, whether serous or fibrinous, are reabsorbed with extreme difficulty; whereas, when infiltrated into the cellular tissue, they in general readily and rapidly disappear. Every thing, therefore, goes to show, that if by massage, or any kind of compression whatever, we could succeed in rupturing the hematic cysts, we should have reason to hope for a cure. By inserting a needle under the integuments, so that it might pass obliquely and break up the sero-sanguineous pouch, we should also be enabled to force the morbid fluid to effuse itself into the neighboring cellular tissue. If we should combine with this process, compression or temporary blistering, it might also be frequently attended with success. With these exceptions, we must come to the seton and complete incision into the cyst or the multiplied incisions.

F. *Seton*.—The treatment of hematic cysts by the seton, is not a new mode of cure. Surgeons of all ages have occasionally boasted of its efficacy. We may conceive, in fact, that this means, by the inflammation and suppuration which result from it, might bring about the fusion (*fonte*), evacuation, and cleansing of the sac. The operation, then, may be compared in every respect to the one for hydrocele, by the same remedy. It is just to remark, however, that the clots, concretions, and various layers, which are then degenerated (*denaturées*) in the interior of the cyst, often prevent the seton from succeeding, and that the inflammation thus produced sometimes takes on a serious character, and but rarely progresses in a manner favorable to the cure.

G. *Incision*.—When kept up by the presence of morbid fibrinous concretions, hematic cysts would seem to demand, above all things, that they should be extensively laid open in order to extract from them these foreign bodies. Under this state of things, we should

proceed in the same way as was done in the time of Celsus in the operation for hydrocele by incision; that is to say, that after having freely laid open the tumor by means of a sharp-edged bistoury, we should empty it and thoroughly evacuate it both of its liquids and all kinds of concretions that might have accumulated there. Having thus properly cleansed it out, it is to be filled with small balls of soft lint, and then covered with the perforated linen, a plumasseau, compress and containing bandage. When the process of suppuration has sufficiently saturated this first dressing, the different portions of it are to be daily renewed, and we proceed to the end of the treatment the same as for an abscess, dressed flatwise and largely opened. This method, which is without contradiction one of the best, has, nevertheless, the disadvantage of not being applicable without danger in every region of the body. In the first place, it would be hazardous to think of it for cysts which exceed the volume of the fist, in whatever locality they might be situated. If, though, of less size, the tumor should be bridled by certain tendons, ligaments, muscles, vessels or important nerves, there would be danger in dividing it through and through. It is, moreover, useless to do that in the immense majority of cases.

**H. Multiplied Incisions.**—It is besides sufficient for the treatment of this class of cysts, to cleanse out their interior thoroughly and to create many openings for the fluid which is constantly tending to become re-accumulated in them. For that purpose I have been for a long time in the habit of treating them by incisions of about an inch in length, and which should not be wider apart from each other than an inch or two, so that I make a variable number of them according to the dimensions of the tumor. The first being made by puncture, enables me to introduce into it my finger, which then serves as a guide and support for the others. Directed through these incisions moreover, the finger enables us to detach and extract whatever there may be of a concrete or foreign nature in the tumor. In order to prevent their primitive agglutination I frequently pass from one to the other a meche of ravelled (*effilée*) linen, in form of a seton, and which I do not permanently withdraw until after the complete establishment of the suppuration. To set out from this period the disease is to be treated like a vast abscess: emollient cataplasms, and then resolvents and compresses saturated with lotions of the same nature, are the only topical applications which can now be of use. The concretions which often adhere to the interior of the cyst in the form of concentric laminæ, are fused and gradually decomposed, and imperceptibly detached and eliminated by the inflammation, and finally escape with the product of the suppuration. After the discharge of all these foreign bodies, the pus, which assumes a better aspect, diminishes in quantity, and allows the engorgement of the tumor gradually to subside, while the walls of the cyst approximate, unite together and become consolidated. It is precisely because of these concrete matters formed from the blood, that hematic cysts do not generally heal until after having been transformed into abscesses and submitted to the treatment most suitable for this last disease. The seton properly so called, and the simple incision, are of less value than the multiplied incisions, because they do not like these



not permit the immediate escape of the foreign bodies and the flow of the pus in proportion as it is formed; from whence it results that at a later period it becomes necessary most usually to superadd multiplied incisions to the seton and simple incision.

I. *Extirpation*.—Sanguineous like all other cysts, seem sometimes to be incurable except by extirpation. But this operation, which is usually long and delicate, and sometimes difficult and dangerous, is no longer admissible at the present day, unless the tumor should have undergone some degeneration of a bad character, or some lardaceous or fibro-cartilaginous transformation. If the diseased cyst could be removed in its totality, it would put it in our power to re-apply the flaps immediately over the bottom of the wound, and to treat the solution of continuity by first intention. In whatever manner done, it is easily understood that this treatment would not be applicable except to tumors that were not of large size and that were sub-cutaneous or inter-muscular. Multiplied incisions more over, which almost always succeed and which are applicable to all cases, do not exact much more time than extirpation to accomplish a radical cure. Extirpation, as respects the operative process, the danger and the consequences of every description, is upon the whole infinitely more serious, without presenting more certainty of success than the multiplied incisions, and apart from some cases of exceptions, I cannot see that it can scarcely ever become indispensable to give it the preference over the latter.

§ II.—*Sanguineous Cysts, according to the region in which they are situated.*

Every effusion of blood having the power to produce an hematic cyst, there is reason to believe that no region of the body can be exempt from this kind of tumor. Whether we examine them in general or particular, it is nevertheless advisable to distinguish them always into two great classes—cellular hematic cysts, and the mucous and synovial hematic cysts.

A. *Cellular Hematic Cysts*.—The first, that is to say, those which are formed in the midst of the cellular tissue, or external to the mucous bursæ, cannot be studied separately as respects operative surgery. I will remark only in regard to them, that every effusion of blood of this kind should be treated, for a month at least, by topical resolvents, compression, massage, crushing, or temporary blisters, before coming to operations, properly so called. Two principal reasons induce me to give this counsel: the first is, that every hematic deposit retains a certain tendency to resolution up to the expiration of the first month, and that if inflammation should not supervene, crushing and blistering succeed quite frequently; the second reason is, that in opening the sac in such manner as to admit of the air penetrating into it from without, we thereby usually excite in it an inflammation of a sufficiently bad character, which readily takes on the form of erysipelas, properly so called, or angeioleucite or phlegmonous erysipelas. At a later period, when the hematic collection becomes completely encysted, the chances of cure by simple means diminish from day to day, while the concentration of the organic lamellæ, which become approximated to each other in order to form the en-

velope to the deposit, diminish in the same proportion the dangers of the operation. The tumor now differs scarcely in any respect from those which have been established in a previously existing cyst, or in a synovial sac. As for the rest, the operations which may be made trial of in such cases, are either the pure and simple incision on a depending part of the sac, the laying of it open completely, or the multiplied incisions. Caustics, the seton, irritating injections, or extirpation, would in general be insufficient or useless in such cases. The operation, moreover, will have to be submitted to the same principles, whatever may be the region of the body to which its application may be useful; and it is in anatomy alone that the surgeon must find the rules for his conduct in hematic tumors of this species particularly.

*B. Synovial Hematic Cysts.*—When the hematic cyst has established itself in a previously existing mucous bursa, there is scarcely reason to hope for its cure by resolution after the first three or four weeks of the disease have passed by. Should there be ever so few clots or concretions in the cyst, it is almost impossible for topical applications, injections and temporary blisters to succeed, and crushing would both be of little effect and extremely difficult. In those cases, therefore, the operation, properly so called, may be proposed without waiting as long as for hematic cysts of the cellular tissue. We may easily conceive that all the mucous bursæ might possibly become the seat of similar cysts; there are, however, some in which they are developed much more frequently than in others, and so to speak, exclusively.

I. *In the head*, for example, hematic cysts have been but rarely observed in the synovial bursæ. It is not the same we shall see with the cellular cysts, (see *Hydrocephalus*.) Upon the temporo-maxillary articulation, at the angle of the jaw or on the symphysis of the chin, the incision through and through would present no difficulty, might be performed as for the opening of an abscess, and might be preferable to the simple incision, unless we should wish to recur to puncture and irritating injections.

II. The mucous bursa of the *thyroid* cartilage, and that of the diaphragm muscle, should they become the seat of a sanguineous effusion, are to be treated in the same manner, unless the tumor shall have acquired a great volume, or the walls of the cyst have undergone a great degree of attenuation. In this last, the irritating injection, if there are no foreign bodies to extract, and the multiplied incisions, under opposite circumstances, should be substituted to the other method.

III. What I have said of the thyroid angle, is applicable in every respect to the mucous bursa of the *seventh cervical vertebra*, and that of the anterior surface of the sternum, and of the summit of the angular projections, (*du sommet des gibbosités*;) but when the cyst is established upon the sides of the spinal column, in the lumbar region, or on the external surface of the muscles, especially the *latissimus dorsi*, it is rare that the total incision of the cyst should have the preference. Supposing the tumor should consist of matters purely liquid, a puncture to empty it, and an iodine injection to inflame it, would almost always effect a cure. If grumulous products, concretions and clots of degenerated blood existed in the sac, to such extent

as to render the success of the injection doubtful, we must then have recourse to multiplied incisions and meches of ravelled linen, (see above.) Six incisions of an inch and a half each thus effected the cure of an hematic tumor which had formed between the spinal vertebræ and the upper part of the arm of a man who was admitted into my division of La Pitié in 1832. A young man who had a similar cyst at the lower part of the lumbar region, was cured of it at the expiration of a month by four incisions of the same kind. A woman, in other respects in indifferent health, and whose life has since been threatened by a diffused erysipelas, had for the space nearly of a year, between the spine and the lower angle of the scapula, a tumor, resulting from a blow, and having half the volume of an adult head. Having laid open this tumor freely on four opposite points, I afterwards passed two setons through it, which were removed at the end of a week, and nothing further has been required to complete the agglutination of the walls of the sac.

IV. The mucous bursa which covers the lower angle of the *scapula*, is quite frequently the seat of hematic extravasations. A young man formerly employed in carrying a hod, presented at the hospital of La Charité, in 1836, an instance of a tumor of this description which was equal in size to two fists. I opened it in three places, and the cure ultimately took place; but the natural mobility of the osseous angle and of the latissimus dorsi and trapezius muscles, presents in this part such obstacles to the obliteration of the cyst, that at the present time I would endeavor before all other things to produce an inflammation in its interior by means of the iodine injection, should it not appear to contain too great a proportion of concrete matters. The simple incision, to which a preference was given in the patient mentioned by Maréchal, (*Nouv. Bibl. Méd.*, t. I., p. 455, 1818,) and who had a bilobate cyst upon the shoulder, brought on a suppuration which ended in death.

V. Upon the dorsal portion of the *acromion*, hematic cysts might be treated as in the general track of the spine. Those on the contrary which form between the deltoid and the scapulo-humeral capsule, would require that we should confine ourselves to the simple incision, as I have done in two instances, or to the iodine injection. This last remark is alike applicable to the sub-tendinous cysts of the olecranon, the sub-muscular cysts of the coronoid process, and sub-bicipital cysts of the radius. Upon the inner condyle of the humerus they would require the same treatment as for that upon the spinous process of the seventh vertebra. The same would be the case for those on the styloid processes of the radius and ulna, and for those on the dorsum of the metacarpo-phalangeal articulations. But the sub-cutaneous mucous bursa of the olecranon, and the synovial cavities of the wrist, require in this respect some special precautions.

VI. *Hematic Cysts of the Olecranon*.—I have noticed in the sub-cutaneous mucous bursa at the elbow all the varieties of hematic effusions. If the effusion is in a liquid state and we are called shortly after the accident, topical applications, compression and the blister should be first made trial of. At a later period, if the tumor is voluminous and almost exclusively filled with fluid matter, puncture and the irritating injection are almost always sufficient. Should the mu-



cous cavity contain at the same time those granulations which resemble rice, barley or millet seeds, and which some persons have mistaken for hydatids or cartilages, puncture and injections no longer have the same efficacy. Multiplied incisions should then have the preference. Though exposing to phlegmonous erysipelas, they are less dangerous than extirpation and succeed full as well, without requiring so long a time for the definitive cure. If, in the place of this appearance of boiled rice or barley, the matters contained in the cyst should simply present the aspect of grumous substances, concretions or ordinary clots of fibrine, the same treatment should still be preferred.

VII. *Hematic Cysts of the Wrist*.—I do not mean under this title either the spiroidal (spiroïdes) tumors which sometimes form in the sheath of the tendons of the thumb on the outer side of the radius, or those bumps (bosselures) of the same nature which are sufficiently often noticed upon the palmar surface of the fingers upon the track of the flexor tendons of those organs; but of the kind of cyst which has for its special seat the synovial cavity in the palm of the hand and on the palmar surface of the wrist. This tumor, of which some examples are found in the ancient collections of observations, but which nevertheless has only attracted attention since the time of Pelletan and Dupuytren, has this remarkable feature, that it is divided as it were into two parts by the anterior annular ligament of the carpus, in such manner that one of these portions projects from the palm of the hand, while the other presents itself above it. Conveying moreover the sensation of a crepitation or friction of granulous bodies gliding upon each other, and a kind of fluctuation when alternately compressed at its two extremities, it is in general easily diagnosed. Having sometimes found them filled with clots of blood, which may still be recognized though comminuted (*morcelés*) I have ultimately come to this conclusion, that the grains of which they are usually composed and which are almost always found in them to the amount of some hundreds, far from belonging to the class of hydatids, as Dupuytren believed, or to that of loose (*libres*) cartilages, as others have supposed, were in fact nothing else than fragments of degenerated (*denaturée*) fibrine or plastic lymph. Whatever may be their nature, these tumors, denominated *bisaculated* (*en bissac*) tumors of the wrist, should be first attacked by every other kind of remedy than that of the cutting instrument, especially by repeated temporary blistering, seeing that no actual operation can be employed for them without danger. The irritating injection, which would be the mildest remedy for them, if liquid matter predominated in the cyst, is without efficacy in other cases. A large seton passed from above downwards through the whole length of the sac might doubtless succeed; but inflammation so readily extends to the palm of the hand, the tendinous sheaths of the fingers and the synovial networks and cellular tissue of the fore-arm, that it becomes the source of real dangers, and sometimes proceeds to the extent of compromising the life of the patient, or at least the preservation of the limb.

What I say of the seton is applicable also to the simple incision on one of the prominences of the tumor, or to multiplied incisions,

or the laying open of the whole tumor, including in this division the anterior ligament of the carpus. I know that F. Aquapendente, Portal (*Hist. Anat.*, t. II., p. 227), Schmucker, (*Bibl. Chir. du Nord*, p. 21), Gooch (*Encyclop. Méth. Chir.*, t. I., p. 545), and Dupuytren (*Gaz. Méd.*, 1830, p. 311, no. 34,) have met with success from the incision, and that Warner (*Obs. Chir.*, obs. 15 and 16, p. 88,) was enabled to divide the anterior ligament of the carpus with impunity, and thus effected cures; but I have seen such frightful results from this method at the Hotel-Dieu and Hospital of St. Louis, that I would scarcely dare recommend it. It is to be added also, that under the most favorable circumstances possible, the walls of the cyst operated upon in this manner, cannot agglutinate without causing such adhesions and confusion of the tendons, which course through the wrist, that a deformity of the hand or of the fingers would be the almost unavoidable result. In this region then, hematic cysts are a species of *noli me tangere*; and we should be on our guard against meddling with them so long as the patients are not greatly incommoded by them, and not until after having made trial of all other remedies, and forewarned the family of the possible consequences of such an operation.

a. As for the rest, when once decided upon, the operation which I should then advise would neither be the seton, nor the simple incision, nor the complete laying open (*la fente totale*) of the sac; I should much prefer three or four *free* (large) *incisions* upon the principal projections of the cyst, which I would then treat as a large (grand) abscess, by emollient topical applications, local sanguineous emissions, and all the different kinds of antiphlogistic remedies. Having seen a young person operated upon by means of the simple incision, by M. Richerand, on the point of dying from the inflammation which seized upon the whole hand and fore-arm, and knowing the consequences of this kind of treatment, as pointed out by Dupuytren, I should not venture upon it but with the greatest repugnance. The two patients in whom I used multiplied incisions having got well, encourage me, on the contrary, to commend this last mode of operating, without, however, presenting it as exempt from all danger. I should add, that in a young man operated upon by me at La Pitié, in 1832, the hematic cyst though very ancient, contained concretions of fibrine and clots of blood still recognizable, but without any of those grains of which I have spoken of above. The four incisions which I made upon it above were followed by an inflammation sufficiently intense to give me at first some degree of uneasiness; but the accidents ultimately subsided, and the cure was accomplished at the expiration of the second month.

b. A *puncture* and a *small incision* aided by compression, have also succeeded so well with M. Champion, that it is well to have recourse to it again. M. Duval, manufacturer of cotton fabrics, consulted me (says this practitioner in a letter to me,) in the year 1810, for a ganglion of a sufficiently large size, which raised up the skin in the palmar surface of the hand, and which was prolonged upon the lower third of the fore-arm, by passing under the annular ligament of the tarsus, which divided it into two bellies. Having used the bandage of Theden for the space of six weeks, without

success, I plunged a bistoury into the lower part of the tumor upon the fore-arm, which brought out more than six ounces of liquid, to which there succeeded soon after, about two teaspoonfuls at least, of small foreign bodies of the size of the eggs of the carp, and of a reddish color, and a slight degree of hardness. The compressive dressing to the hand had been reapplied before the operation, and I continued its application to the cyst, and the whole limb as high as the axilla, by means of a bandage kept moist with oxycrat and salt, cold. The incision, which at first was only four lines in length, had to be enlarged to effect a passage for the small granulated bodies. No accident took place, and scarcely any inflammation supervened. The dressing, or the roller bandage, was continued for a month, restricting it soon to the surfaces which corresponded with the disease, and the cure was complete. I operated, says M. Champion, upon a second and similar case in 1822; only that the tumor was of less size. The incision gave egress also to concretions, but in smaller quantity, and the success was the same.

VIII. The *Lower Limb*.—If the mucous bursa of the antero-superior spinous process of the ilium should be transformed into an hematic cyst, it would become necessary to attack it like that of the olecranon. It would be the same with that on the outer border of the great trochanter, and on the outer surface of the thigh. I have met with one example in front of the spine of the tibia, and which disappeared under the influence of two temporary blisters. The same took place in the case of an hematic cyst at the head of the fibula. The sub-cutaneous hematic cysts upon the posterior surface of the heel, and upon the dorsal and inner side of the scaphoid bone, the projection of club feet, and the dorsal and inner side of the first and other bones of the metacarpus, do not exact also other precautions than those of the corresponding regions of the hand. Upon the stump of persons amputated, these tumors should not be treated but with a certain degree of reserve, inasmuch as their suppuration, from their being situated on the apex of the bone, would obviously expose to necrosis. Between the great trochanter and the coxo-femoral articulation, between the gluteus minimus muscle and the same articulation, between the obturator internus muscle and the lesser sciatic notch, under the tendon of the iliacus internus muscle, upon the apex of the little trochanter, between the triceps and the rectus femoris, under the ligamentum patellæ and between the tendons of the pes anserinus, between the os calcis and the tendo achillis, where I have met with three examples, also on the plantar surface of the foot,—hematic cysts if somewhat ancient, scarcely ever yield to the application of topical resolvents, nor even to large temporary blisters. As on the other hand there is some danger of producing suppuration, they should be treated by puncture and irritating injections, provided they contain a sufficiently strong proportion of liquid matters. In the contrary case, I know not in reality which should have the preference, whether the seton, the simple or multiplied incisions, or the complete division.

IX. I have often observed hematic or sero-sanguineous cysts upon the dorsal and inner regions of the metatarso-phalangeal articulation of the great toe. In this place temporary blistering and topical ap-



plications of all kinds should be made trial of before proceeding farther. Supposing such means should produce no effect, we should not even then come to the operation, unless the tumor was in reality a source of serious annoyance to the patient. These mucous bursæ are so near the articulation, with which moreover they sometimes communicate, that we should never divide into them or lay them open, nor, in a word, carry the cutting instrument upon them unless compelled to do so. I have seen two patients upon the point of perishing in consequence of such attempts, and through means of a suppuration, which after having invaded the articulation ultimately left therein caries which rendered amputation necessary. Platner, (*Coll. Acad., partie étrang.*, t. VIII., p. 43, du Discours Préliminaire; also Paul, *Suppl. à la Chir. d'Heister*, p. 50.) speaks of a ganglion of the synovial cyst of the tendo achillis, which having acquired an immense size, was followed by serious accidents, though nothing had been done to it. I saw, says M. Champion, a synovial ganglion of the same kind eight years since, in a woman aged 36; it was of the size of the fist and its form was elongated. I recommended puncture and compression, and rest for the space of a month and more. The patient more alarmed at the period of time than the operation, consulted an officer of health, who promised he would make a more speedy cure. An incision was made; and soon after a fungus formed on the inside surface of the cyst, and acquired a very considerable size, ending in the death of the patient.

X. The mucous bursa on the dorsum of the foot, which I have seen transformed into an hematic cyst in three instances, would require the same precautions, though there might perhaps be a little less danger of the inflammation prolonging itself to as great an extent as in the preceding case.

XI. The malleolar hematic cysts I have met with, have all been treated by the multiplied incisions; but it would be prudent to attempt their cure by irritating injections if they contained a large proportion of liquid matters. The neighborhood of the fibro-synovial sheath of the peronei tendons on one side, and of the tibialis posticus on the other, together with the character of the tibio-tarsal articulation, should always make us avoid as much as possible the establishment of a purulent inflammation in that quarter.

XII. It is upon the knee that hematic cysts are the most frequently met with. Those which develop themselves upon the outer or inner condyle of the femur, rarely acquire a large size, and may be treated by crushing, sub-cutaneous puncture, or irritating injections, when they have resisted both topical resolvents and temporary blistering. There will be opportunity moreover after these means, to attack them by a complete division or by multiplied incisions rather than by the seton.

XIII. Those *in front of the patella* and which are so often encountered in practice, and of which I have seen so great a number of varieties, require especially that I should allude a moment to them. In this part I have met with them of the form of a plate of little thickness, four or five inches long and from two to four fingers' width in breadth; at other times presenting a bi-sacculated appearance or an irregularly embossed (bosselée) mass, or hemis-

spherical, or taking on the character of a transverse bourrelet [like a collar, T.] I have seen them of the size of the fist, though ordinarily they do not exceed that of a pullet's or turkey's egg. Sometimes filled exclusively with liquids, either viscous, or purely serous, or lactescent, and of a reddish brown or simply a roseate tint, they very often also contain clots of a fibrinous or reddish matter, still possessing most of the characters of clots of blood; sometimes simple greyish or yellowish clots that are friable, or as it were, cartilaginous and exceedingly variable in number; at other times a species of columns or movable bridles that are hard and slippery and of a cartilaginous aspect, and adherent by one of their extremities or even by both, so that in pressing them upon their exterior they convey a sort of crepitation which is sufficiently distinct and altogether of a peculiar character. The extirpation of these cysts, which MM. Pezerat (*Journ. Compl. des Sc. Méd.*, and *Bibl. Méd.*, 1827, p. 414) and Hervez (*Journ. Hebd.*, t. III., p. 329,) still seem to prefer in adducing facts in support of it, would not become indispensable unless their walls should have acquired an extreme degree of thickness, and a fibro-cartilaginous density. In such cases we should proceed in the manner pointed out for concrete hematic tumors. When the cyst is not of a very ancient date and [its contents] almost exclusively liquid, it is advisable to commence with topical resolvers, compresses saturated with ammoniacal vinegar or any other solution of sal ammoniac. The temporary blister would come in as a second remedy. I have seen a certain number of hematic cysts of the knee, which had existed over three weeks, dispersed by employing this description of remedy. [Our author (see Vol. I.) means by temporary blistering (*vésicatoire volant*) the successive application of small blisters composed as usual of Spanish flies, combinations of ammonia, &c., left on for a short time and changed in their locality. Vesication is not intended, but only a phlogosis or commencing inflammation, redness, &c., so as strongly to direct the sanguineous and other currents to the part. So far however from this temporary or transient mode of applying blisters, and which the author much insists on as an extremely valuable remedy, being a reliable one here, we ourselves have, on the contrary, found even in these largest sub-cutaneous mucous (properly *serous*, see our notes *infra*) bursæ, of old date, i. e., a year or more, and covering the whole patella of an adult, being like a large inverted cup, effectually cured for a length of time by means of a continuous copious drain of suppuration kept up on the dermoid surface of the tumor by thorough, repeated and full blistering, i. e. by the ordinary mode of applying this remedy. However, as I have repeated, (Vol. I.) *bursæ* of the largest description, provided their contents are liquid, and their walls and the neighboring tissues are not intensely inflamed, are, whatever may be their date, best and most effectually and radically cured by *percussion*, i. e. *écrasement* or crushing, &c. T.] At a later period we would have but little to expect from topical applications and the blister. We must then endeavor to ascertain if it is liquid matter, or concrete, that fills the synovial bursa. In the first case iodine injections would have a decided preference over every other preparation. I have made use of them on three occasions under

such circumstances, and the result has been as simple as in a case of hydrocele. The trochar being plunged in at the summit of the tumor from below upwards, while the leg is in extension, enters into the cyst as it does into the tunica vaginalis, allows us to extract all the liquid, and afterwards to inject into the cyst the medicated compound with the greatest degree of ease. Similar successes also were obtained formerly by various practitioners, and in our own time by M. Asselin, who gives two fine examples of them; also by M. Paul Guersent, as well as by M. Laugier.

The efficacy of irritating injections for cysts in front of the knee, therefore, is at the present day a point definitively adjudged. When the cyst, on the contrary, contains a sufficiently large proportion of solid clots, it is probable, though not yet demonstrated, that the injection might not be successful. The most suitable operation then, is not that of the seton; the pure and simple incision, with the introduction of a tent into the cyst, which I have done four or five times, is far from being always successful. The walls of the tumor only partially agglutinate, and the effusion generally is ultimately reproduced. The tumor returned in three patients that I operated upon, and the other cases were cured only by means of a violent inflammation, which speedily involved the whole anterior portion of the knee. It is necessary, moreover, in all cases, that this incision should be near an inch long, if we wish to have no difficulty in the discharge and extraction of the foreign grumous bodies contained in the cyst. The crucial incision also, which I have sometimes made use of, and which many practitioners have sanctioned, is an operation too serious in its consequences, and leaves a wound of too great length and too difficult of cicatrization to merit general adoption. The same may be said of excision, which was still employed by Percy or by Laurent, (*Eloge de Percy*, p. 25.) Multiplied incisions, consequently, are those to which I give the preference in these cases. These incisions being made of about an inch in length, and placed one above, another below, and one on each side, and as near as possible to the circumference of the sac, and whose agglutination is prevented by means of a meche of ravelled linen during the first four or five days, enable us to empty the sac completely, and thus create an inflammation in it, which almost unavoidably results in the consolidation of its walls. Certain it is, that the patients treated by me in this manner, have all been cured in the space of from three to six weeks. I ought, however, to add, that in a man operated upon in this manner in 1837, at the hospital of La Charité, for an hematic cyst at the elbow, the disease in consequence of another fall on this part, was reproduced in 1838. We must, moreover, not forget that sudden movements, as well as the want of proper care in the dressings, would incur at the knee more than in any other part, the risk of angioleucitis, erysipelas, and diffused phlegmons of a formidable character. I have only in three instances seen the sub-ischiatic mucous bursa, transformed into a sanguineous cyst. In this region the disease may present some difficulties in the diagnosis; but it should be submitted to the same processes of operation as in front of the knee, and the suppuration would be far less dangerous than in the vicinity of this latter articulation.



## ARTICLE III.—SEROUS CYSTS.

Under the title of serous cysts, we should, strictly speaking, comprehend all tumors consisting of a pouch, filled with aqueous liquid. We should thus designate under this name the greater part of hematic, hydatid, and synovial cysts, as well as all serous cysts properly so called. Under the title of serous cysts, however, I shall speak only of those tumors which are independent of the natural mucous or synovial cavities, and which are constituted of an unnatural accumulation of diaphanous and exceedingly fluid liquid. All that I shall say of them, moreover, is exactly applicable to synovial cysts of the mucous bursæ, and to those tumors known under the name of *hygroma*. This description of cysts does not belong only to those exhalations, which sometimes take place in the midst of the cellular tissue, and without any appreciable degeneration. A lymphatic ganglion, or any glandular organ whatever, or the presence of any foreign substances, may become the source from whence it originates. An enormous cyst occupied the entire supra-hyoid region from one parotid cavity to the other; M. Malcolmson (*Gaz. Méd.* 1838, p. 743) excised an ellipse from it below the jaw, and the liquid escaped together with a foreign body. But a kind of gland was noticed at the bottom of the sac; this gland being secured with a hook and excised, and, in fact, extirpated almost in its totality, had the appearance of belonging to the sub-maxillary gland. Was it not, perhaps, a degenerate lymphatic ganglion? at least the serous cyst was certainly dependent upon it. Marchettis (Bonet, *Corps de Médec.*, t. III., p. 239, obs. 38) speaks of a tumor of the size of a pullet's egg, situated in the neighborhood of the trachea, and composed of two cysts full of serosity, and imbedded one within the other. The author adds that there was at the bottom of the sac an excrescence which it became necessary to excise, which authorizes us in suggesting that a lymphatic tumor had been the point of departure of the disease. Muralt (*Ephémérides des Cur. de la Nat.*, dec. 2, an. III.) also speaks of serous cysts which contained either bones or other foreign bodies, as well as a pound weight of serosity. In 1838, a man came to the hospital of La Charité, who had a tumor in the scrotum of the size of two fists, with all the characters of hydrocele, from which about two glasses of a rose-colored serosity had been already extracted by puncture a year before, and which was soon afterwards reproduced. Suspecting that this cyst depended upon a degenerate hematocele, I operated upon it with the multiplied incisions. Various accidents supervened, and the patient died at the expiration of fifteen days. But this cyst, which contained more than ten ounces of a liquid almost entirely serous, was the result of an encephaloid degenerescence of the testicle, which latter, however, had only augmented to about double its natural volume. I have, moreover, seen cysts that were purely serous, form in the groin, under the jaw, and in the sub-hyoid region, in consequence of previous diseases in the lymphatic ganglions, or in the thyroid gland.

The preceding remarks were necessary to show that serous cysts are far from always constituting a simple disease, or from being all

of them susceptible of dispersion with the same certainty by the action of the same remedy. I will add, that after contusions or bruises which occasion infiltrations or extravasations under the skin, we see quite often the coagulable and coloring matter of the blood disappear, and give place to a serosity or viscous or unctuous fluid, which is almost in every respect analogous to the synovial fluid. Serous cysts, in whatever way produced, may acquire an enormous volume. According to Percy, (*Dict. des. Sc. Méd.*, t. XXVII., p. 50) Levret met with one which extended from the dorsal region to the ham. Powel, (*London Med. Jour.*, t. II., p. 144, 1785,) gives another example of one which was cured by incision, and which descended from the shoulder to the spine of the ilium. Their ordinary size, nevertheless, rarely exceeds that of a pullet's egg, or the head of an infant or of an adult, [being at the same time] more or less irregularly deformed. The shape and size of a round loaf of bread, as in the case mentioned by Saucerotte, (*Mé. de Chir.*, t. II., p. 391,) is however by no means extraordinary. These cysts, moreover, may be developed on almost all the regions of the body. All practitioners know that the free border of the lips and eyelids are frequently the seat of tumors of this kind, which rarely exceed the dimensions of a small bean, and for the speedy cure of which, all that is requisite is to lay them open and cauterize them with nitrate of silver. Jourdain, (*Malad. de la Bouche*, t. II., p. 195,) a long time since, noticed the presence of serous cysts in the substance of the lips. M. Pl. Portal, (*Clin. Chir.*, p. 289,) gives an example of one upon the lower lip. I have met with them of the diameter of an inch or the half of an egg, once on the anterior region, and another time on the side of the right parietal bone. M. Champion, (communicated by the author, 1838,) operated for one of the size of a small pullet's egg, and situated under the left temporal muscle. In Heister also (*Thèses de Haller*, t. V., p. 241, French translation,) we meet with an example of a serous cyst as large as an egg, which had developed itself under the ear. In another patient, whose case M. Champion has transmitted to me, the tumor, which was bilobate and situated between the muscles, occupied the left portion of the supra-hyoid region, and projected at the same time within the mouth as well as below the jaw, where it was equal in volume to a turkey's egg. I have also seen, in the same situation, a similar cyst of the size of the fist, in an infant aged twenty months. In treating of the operations which are performed on different regions of the neck, I shall have to return to the serous cysts, which are sometimes produced by affections of the thyroid or of the salivary glands. The surface of the thorax is sufficiently often the seat of similar cysts. Rudolphi (*Jour. Analytique*, 1828, No. 7, p. 103,) mentions one under the pectoralis major, and which resembled a schirrhus. I have also seen one which was of the size of two fists, in a boy aged fifteen years, and which being situated in front of the axilla, presented the form and other appearances of a firm and well-developed mamma. Heister speaks of a cyst of this description which was situated on the side of the spinal vertebræ; and I have frequently met with cysts on the different regions of the back, which, though of hematic origin, were nevertheless completely filled with serous liquid. Though M. Basletta (*Bullet.*

de Férussac, t. X., p. 95,) was successful in curing his patient of a cyst of the size of an egg, filled with palish (pallacée) matter, and situated deep within the abdominal walls, and communicating with the peritoneum, it was not so with M. M'Farlane, (*Encyclop. des Sc. Méd.*, 1836, p. 55,) whose patient died after the puncture of the cyst, which was between the peritoneum and muscles. M. Tavernier speaks of one which was situated between the abdominal muscles, and which, having made an opening into the belly, also caused death. In the collection of M. Ouvrard, we also find an instance of a serous cyst of considerable size situated upon the back. A serous cyst of the size of an orange was successfully removed by M. Pl. Portal from the back of a man aged fifty years, (*Clin. Chir.*, p. 281.) Serous cysts have been noticed upon the breech by M. Récamier, (*Gaz. Méd.*, t. I., p. 319, No. 35,) and a great number of other practitioners. I have myself often seen them in this region; but it is at the fold of the groin where they are most frequently found, and where I have met with them of the size of a child's head.

M. Jaudard (*Thèse*, Strasbourg, 1816, p. 14, obs. 4) states that he saw one at Lyons in the service of M. Bouchet, which was situated about the middle of the inner part of the thigh. That mentioned by Paroisse (*Journ. Gén. de Méd.*, and *Dict. des Sc. Méd.*, t. XXII., p. 133,) occupied at the same time the thigh and the leg. I have often had occasion to meet with them on the different regions of the arm and fore-arm, on the body of the thigh and leg, and on the foot and hand. All the *operations* I have described for hematic cysts, are applicable to those that are serous. Leaving aside what relates to the employment of topical applications, compression, blisters, and even caustics, I would remark that crushing and puncture with the needle would not succeed, except in certain cases, and should not be had recourse to unless it should be impracticable to make use of irritating injections. This last means, in fact, especially if tincture of iodine be employed, is so perfectly simple and of such unfailing efficacy, that it should be preferred in every case where no particular operation would forbid its employment. Should the cyst not be very large, we should make use of a very delicate trochar and a syphon-syringe corresponding. In other cases we should proceed in the same manner as in the operation for hydrocele, and should succeed equally well. Supposing, however, whatever the reason may be, that we do not wish to make trial of this remedy, an opportunity would then present for puncture or the simple incision of the cyst: this sometimes suffices to bring on inflammation, suppuration and a definitive cure. A woman of 45, had in the left groin a tumor with thick walls, slightly *bosselated* (bosselée\*) on its surface, of the size of the head, but without ever having caused her any pain. This woman, who had been addressed to me at La Charité, had her tumor punctured by M. Vidal, who took from it two glasses of a limpid serosity. Finally, a purulent inflammation established itself in the

\* We shall venture on the coining of this word, as *bosse* and *bossel* (from whence *embossing* in English—i. e. sort of *basso relievo* or fret-work in the ornamental arts), are not translatable with precision, certainly not with elegance, by bumps, lumps, bunches, bumpy, &c., although they may rudely convey the idea of the inequalities, or elevations and depressions meant. T.



sac, and the pus opened for itself an outlet through the puncture which had caused it. The tumor was reduced little by little, to the volume of a pullet's egg. Seeing that the process of resolution was suspended, I considered it to be proper, before having recourse to a complete division of the sac, to make trial of a large temporary blister. Eight days after, the walls of the sac were found completely agglutinated, and the patient soon after demanded her dismissal from the hospital, being in a state of perfect cure. If however puncture or the simple incision should seem insufficient, we should come to the complete division of the tumor, should it not exceed a small egg in its size, or in the contrary case, insert through it one or several setons, or better still, divide it on several points of its free portion by means of large incisions. As to extirpation, it is neither more efficacious nor more certain in its effects than the preceding method; and as it is obviously the most dangerous and most difficult, and the longest of all, it would be advisable in general to reject it. Up to the present time I have not used the iodine injection for curing serous cysts, except in the boy who had one on the outer side of his breast, and in the infant who had so vast a one in the supra-hyoid region; but these two examples have satisfied me that a remedy like this will succeed in at least fifteen cases out of twenty, and that it should be made trial of before all others. Serous cysts developing themselves external to the natural organs and cavities, cannot be examined in a topographical point of view. The operative process which relates to them should consequently be submitted to simple general rules, whether it be crushing, puncture, injection, the seton, incision, or multiplied divisions, or finally excision of all its most attenuated portions, or its extirpation, when it is of too large a size to allow us to hope for perfect agglutination of its walls. Among serous cysts there are some that are multilocular [i. e. having several compartments, T.] or truly hydatid. In such cases we should have to qualify what I have said of irritating injections and the different kinds of incisions. It would be next to impossible here to look for a radical cure by means of the seton, the simple incision, or even the multiplied incisions, unless the operation, perchance, should include all the vesicles of the cyst. To operate then in such a case with any chance of success, it would be necessary to lay open the tumor throughout all the compartments (locules) of which it is made up, or to extirpate it entire. An hydatid cyst which existed in the iliac region was successfully extirpated by M. McFarlane (*Encyclop. des Sc. Méd.*, 1836, p. 54), and M. Colson (*Rev. Méd.*, 1827, t. IV., p. 33) found one of this description between the bladder and the rectum. Whether the tumor in this respect, in reality contain hydatids, or is composed purely of serous receptacles (vacuoles), the indication, notwithstanding, will be the same. It would only be a loss of time to attempt the other operative methods described farther back, and which, besides their little efficacy, would expose to real dangers.

#### ARTICLE IV.—SYNOVIAL CYSTS (NODUS-GANGLIONS).

Tumors known under the title of synovial cysts, were formerly designated by the name of ganglions or *nodus*, and it is these, which

people in general call *thickened, knotted or twisted* sinews, [nerfs foulés, noués or tordus—sometimes “weeping sinews.” T.] Developing themselves in the neighborhood of the joints, or upon the track of the tendons, these tumors rarely exceed the size of a nut or egg. All of them appear to consist of a sort of cul-de-sac or hernia, or appendix to the natural synovial cavities, whose neck (collet) had been obliterated from some cause unknown. They may be divided into two classes: 1. Articular synovial cysts; and 2. Tendinous synovial cysts. Nothing, however, is so variable as the development and progress of such tumors. Moinichen mentions having seen them disappear on the approach of parturition, and afterwards re-assume their primitive volume. M. Champion mentions having seen one which shrunk for several years successively, every two years, about spring-time; but it appears in this case, that the shrinking of the cyst was owing to the accumulation of the liquid producing a crevice. We may conceive that the disease then acts similarly in fact to a hydrocele, which has been accidentally ruptured, and is soon after reproduced. As synovial cysts do not ordinarily cause any pain, many patients will carry them all their lives, without applying any remedy or paying any attention to them. I have seen a woman fifty years of age, who had three of them about the abductor and extensor tendons of the thumb for more than twenty-five years. I have seen others at the dorsal region of the foot, about the knee, and on the track of the different tendons of the hand, which had existed to full as great a length of time, without the persons who were afflicted with them, ever having thought of applying any remedy to them. I should, in fact, add that many of these cysts ultimately, in the course of time, disappear spontaneously. They are not to be attacked by surgical means therefore, unless by their volume or relations, they produce either deformity, inconvenience or pain, or functional disturbance to such extent as to induce the patient to incur the *risk* of the operation.

#### § I.—*Various Means.*

Nothing also, is more variable than the treatment for this description of tumors. M. Ch. H. (*Encyclop. Method.*, t. XIII., p. 617, col. 2, 1832,) had a ganglion of the size of a small nut, on the flexor tendons of the left ring and middle fingers. Having, in vain, consulted most of the distinguished physicians of Paris, the patient, who put himself upon the use of the muriate of soda, of which he took from two to three ounces a day, in this manner effected a radical cure. Gilibert (Rousset, *Thèse de Strasburg*, 1812, p. 6,) says he has seen a case of this kind in which satchels of plaster, or leaves of lavender, succeeded. Frictions with aromatic, mercurial and camphorated mixtures, laurel oil, soap and water, saliva, resolvent plasters, hard and repeated rubbings and baths of sulphur-water, equally appear to have been followed by some successful results. Dupuytren, according to M. Bouboucki, (*Thèse*, Paris, 1828, p. 25,) dispersed a synovial ganglion in the ham, by means of the simple *douche*. But were it allowable to make trial of such remedies, it would be puerile to count on their efficacy, unless in some very rare exceptions.

### § II.—*The Temporary Blister.*

Or even one that is permanent, would deserve infinitely more confidence. Jæger, (*Dict. de Chir.*, t. I., p. 526,) who made use of them for cysts at the knee, asserts that he obtained positive advantages from them. I have elsewhere published (*Archiv. Gén. de Méd.*, 1826,) the case of a synovial cyst on the posterior region of the wrist, which disappeared under the action of two large blisters, though it was of very ancient date, and of the size of half an egg. I have often succeeded with the same remedy since, in similar cases. A lady, who had one of the size of a large nut, on the dorsum of the foot, opposite the calcaneo-cuboidal articulation, and who would not hear to an operation, was also cured by means of large temporary blisters and resolvent frictions, and compression. Though I might cite at least as many as ten analogous facts, I ought, however, to remark that most synovial cysts will not yield to this therapeutic.

### § III.—*Moxa.*

*Moxa*, which has already been made trial of for a cyst of the wrist by M. A. Severin, (*Méd. Efficace*, p. 550, § 1998,) and which M. Champion also says he has used with success in a patient who would not submit to any other means, would not probably be any more effectual, and has too many inconveniences in itself ever to become the favorite remedy for this disease.

### § IV.—*Caustics.*

Though the employment of caustics may have succeeded with F. de Hilden (*Centurie* 3, obs. 79, or p. 72; obs. 44 of the French translation,) in curing a synovial cyst of the carpus, and an arsenical application have been equally successful with Woolam, (*Annal Muyskezas*, t. III., p. 490, 1811,) such remedies, nevertheless, have in all epochs inspired the most vivid apprehensions. Dalechamps (*Chir. Fran aise*, p. 158, in-4°; p. 910, in-8°, 1570,) relates that a patient, with synovial cysts on the dorsum of the hand, who was treated for them by caustics, did not recover until after having experienced very severe inflammatory accidents. It is moreover evident that this kind of operation, would be exposed to all the consequences to be apprehended from a cutting instrument, without having its advantages. Their uncertainty and the deformed cicatrices which they would necessarily produce, will always be sufficient to proscribe their use with the generality of practitioners.

### § V.—*Compression.*

One of the remedies against synovial cysts which has been most extolled is compression; the ancient authors had already noticed it. La Vauguyon (*Traité d'Operat.*, p. 627,) recommends that it be made with a plate of lead, and that frictions be associated with it. This plate of lead, adjusted by a pelote and circular bandage, has been proposed anew by Marigues and Testat. (*Malad. Chir.*, 1786.) Theden, the great admirer of compression, says that by means of



this, with lotions of the arquebusade water, he cured a synovial ganglion in the space of six weeks. New facts also in favor of this remedy have been brought forward during the course of the present century, by M. Balme (*Dissert. an. X.*, p. 39,) and M. Godele, (*Rev. Méd.*, 1831, t. I., p. 19.) It is nevertheless true that compression alone rarely succeeds with synovial cysts, and that in order to obtain any cures from it, it would be necessary to apply it with such force and to continue it so long a time, that in reality it scarcely deserves to be made trial of except as an auxiliary to other operative methods.

#### § VI.—Crushing, (écrasement.)

A more efficacious remedy, and one which surgeons have in their pride erroneously associated with the practice of vulgar people or charlatans who itinerate about the country, is that of crushing the cyst. This remedy, which at first sight, appears so rude, had already been employed in the time of Philagrius, (*Peyrilhe, Hist. de la Chir.*, p. 702,) Chaumète, (*Enchiridion des Chirurg.*, ch. 3, p. 122, 1560,) and Forestus, (Bonet, *Corps de Méd.*, t. III., p. 60.) Muys (*Decad.* 2, obs. 8, p. 127; *Nouv. Obs. de Chir.*), armed with a leaden palette, cured in this manner a cyst at the wrist, and similar successes were obtained by Ledran (*Consult. de Chir.*, p. 257,) and by Godele (*Rev. Méd.*, 1831, t. I., p. 17.) I have, says M. Champion, often crushed ganglions in the palms of the hands, by means of the thumbs crossed, or by a single thumb; but there is a good number of them that will not yield to this kind of pressure. This practitioner, who agrees in this with Heller that crushing is very uncertain, almost always uses a mallet and a piece of paste-board cut in the form of a shovel. A single stroke properly applied ordinarily answers in such cases. This compression [rather *percussion*, T.] astonishes much more than it does harm. On the carpus and the tarsus it has never, says M. Champion, failed. A man who swooned away immediately after the stroke, confessed subsequently that it was from fear. This process, which the rebouteurs (rebouteurs) and peasants have employed from time immemorial to *untie the tendons*, requires that we should place the limb upon a solid support while making the stroke with the mallet, and that the cyst should afterwards be properly compressed during some fifteen days. I have often in my boyhood, seen peasants in the country strike the fist violently upon the wrist, and in this manner cure synovial cysts of the hand. I have seen others who did the same thing on the foot, and I should add, that unless there be a very considerable degree of muscular force exerted, we fail in most instances when we attempt to crush by the thumbs alone. This crushing [or sudden rupturing or bursting of the sac, T.] is in short an operation to be made trial of. It is, however, exposed to two inconveniences; sometimes there results from it an inflammation sufficiently acute, and I have seen three patients in whom it was attended with such accidents, that a vast suppuration was established in the limb, and their life for a long time kept in jeopardy.

When every thing goes on naturally, the tumor retains a great tendency to be reproduced; more than half of the synovial cysts which I have treated, or caused to be treated in this manner, have

returned at the end of some weeks, or some months. We should, however, render success more certain by associating with this remedy repeated temporary blistering, resolvent frictions, and compression for a long time continued.

[We refer the reader for the advocacy we have made of this invaluable resource of *sudden and powerful percussion*, to what we have said above of these bursal cavities or cysts, when they contain other than pure synovial fluid—to which the author here confines himself. Also to our remarks in Vol. I., and also infra, on the same mode of treatment. The cases in which we have used it, and we never employed any other remedy, were of the character of synovial cysts proper, in their normal state, so far as they were unchanged in structure and containing their normal sero-synovial fluid, only accumulated in abnormal quantity, therefore literally, as by the vulgar name, a weeping ganglion. In every case the blow made with great rapidity and force, by a heavy book held in both my hands, and at the height of two feet above the tumor as the limb lay firmly stretched on the table, I succeeded in perfectly and radically curing the disease, in an instant. The tumor entirely disappears under the blow which crushes it, so that the deformity, as if by magic, leaves thus the smooth natural plain surface of the skin. In one of the cases at the olecranon, where it appeared somewhat bosselated, the disease returned partially in a few weeks, but a second blow completed its extinction. In a very recent case, the tumor being of the size of a small nut and on the ulnar side of the dorsal surface of the radius, about two inches above the wrist, (caused in a stout young Irish porter from lifting heavy trunks,) and resting, in fact, partly on the interosseous space, I was enabled, by proper pronation, to bring the tumor on to the edge of the radius, and by this means procure a solid osseous point d'appui. I would recommend this course of pushing the tumor where it can be done, on to a bony plane, before the blow is struck. This I advert to, because I believe it practicable, in most instances, on the dorsal surface of the metacarpus, where the tumor lies on an interosseous space. In one such case I recommended it to a very bold practitioner, who nevertheless pursued his own course, opened the sac and caused a severe, if not dangerous inflammation. In striking the blow, it must be done with a good deal of force and with a heavy quarto book for example. In the cases of our author, whenever the disease returned, he was perhaps too sparing in this respect, towards his patients. This beautiful illustration of sub-cutaneous or sub-muscular, or even sub-aponeurotic surgery, (for I should consider a synovial tumor beneath an aponeurosis, provided the tumor could be made to rest on bone, equally curable by this mode,) excludes effectually every other treatment, and for myself, I never saw the slightest accident supervene from it. Nor have I found the least degree of compression necessary after the *ecrasement*. T.]

#### § VII. *Sub-cutaneous Puncture.*

Some surgeons, having confidence in the rupture of the sac, and experiencing some difficulties in effecting it, have proposed to introduce obliquely under the skin a cataract needle, and thus puncture

the little synovial pouch so as to allow of expelling its contents and forcing them to become infiltrated into the neighboring cellular tissue. M. Cumin, (*Journ. Univ. des. Sc. Méd.*; *Journ. Analytique*, t. I., p. 367, Nov. 1827; *Bull. de Férussac*, t. XIV., p. 225; *Arch. Gén. de Méd.*, t. XIV., p. 252,) who appears to have been one of the first to suggest this operation, recommends with reason, that we should make use of compression also after having emptied the sac. I have attacked in this manner a synovial cyst on the dorsum of the foot, another which was situated in front of the malleolus externus, and similar tumors on the back of the hand and wrist, without ever having obtained a single radical cure. The tumor was emptied and the sub-cutaneous layer of the neighborhood became slightly œdematous; but the cyst soon filled again and the disease reappeared as before, whatever M. Roberts (*Journ. des Progrès*, t. XII., p. 258; *Rev. Méd.*, 1829, t. I., p. 299) may say on this point. To obtain any favorable results from this means therefore, it would be necessary to associate with it not only compression, but also temporary blistering and resolvent frictions.

#### § VII.—Seton.

*Puncture*, and the abstraction of the liquid by means of a syringe or gum-elastic bottle, as recommended by Monro (*Ancien Journ. de Méd.*, t. LXXIX., p. 138,) would be at the same time more difficult and also still *more uncertain*. The seton, which has been employed by quite a great number of practitioners, and which is mentioned by M. Ch. L. (*Encyclop. Méth.*, t. XIII., p. 618,) and also by M. Cooper, is considered by others (*Journ. de Méd.*, t. V.) as calculated to induce a cancerous degenerescence of the ganglion. At the present time the seton might be made trial of under a form less dangerous. One, two, three or four simple threads passed through the tumor, as has been said of *Erectile Tumors* and *Varices*, and withdrawn after the lapse of some days, would probably be sufficient to create a moderate degree of inflammation in the cyst, and to effect its resolution. But how could we then avoid one of two inconveniences, a purulent inflammation which would not be unattended with danger, or too slight a degree of irritation, which would prevent our succeeding? Without, therefore, absolutely condemning this remedy, we ought not to repose too much confidence in it.

#### § IX.—Irritating Injections.

Irritating injections, though made use of by some practitioners, have, however, always excited some apprehensions when about to be employed for synovial cysts. The inflammation which it is proposed to excite by them, has been considered dangerous, in consequence of the neighborhood of the articulations. It is true that some accidents have resulted from them; that a woman on whom they were used and who came to the hospital of the Faculty in 1824, was seized with all the symptoms of a phlegmonous erysipelas on the dorsum of the hand, where the cyst was situated, and on a portion of the dorsal region of the fore-arm; but, I do not think that the subject has been sufficiently examined. The synovial cysts are *legitimate serous cavities*; [see note infra, where the propriety of thus



giving the name *serous* rather than *mucous* to the various *bursæ*, is well sustained. T.] Every thing leads to the conclusion that an irritating liquid would produce an adhesive inflammation there, as in the tunica vaginalis. Provided this injection was made through a simple puncture, and not pushed to the extent of tearing (*érailler*) the cyst, and of becoming infiltrated into the cellular tissue of the neighborhood, we cannot see what evil consequences would result from it. The phlegmasia thus produced under the skin, should it extend even to the articulations, is not comparable to ordinary inflammations, or such as are produced by the action of some internal cause or external violence. Perhaps, also, the irritating injections have sometimes been followed by unpleasant consequences, because of the quantity or nature of the liquid made use of. Certain it is, that the tincture of iodine, which may be introduced in moderate proportions into every serous cavity, and which seems to have the power of infiltrating itself, at least partially, into the cellular tissue, without producing gangrene, has hitherto enabled me to obtain a number of cures which, by their simplicity, have been moreover of the most encouraging description.

A man aged from 30 to 35 years, had on the dorsal surface of the tarsus a synovial cyst of half the bigness of an egg; I punctured it and drew out about two spoonfuls of a serous liquid. Two gros of tincture of iodine diluted, were injected in their place, and every thing went on with the same simplicity as in the operation for hydrocele. The same operation performed twice on ganglions of the wrist, once below the external malleolus, and in another instance on the dorsum of the hand, have been followed with the same satisfactory results. I have seen it fail, however, in a man who had a synovial ganglion on the dorsal surface of the foot; but here the cyst was filled with gelatinous matter, and the injection caused no appearance of inflammation or reaction. In conclusion, therefore, it would seem, that irritating injections, and especially tincture of iodine, should be employed wherever the cyst is of a certain volume, and is found filled with matters purely serous. I would remark only, that they should be punctured with a small trochar, and not with the bistoury, and that a certain quantity of the tincture of iodine injected should be left in their interior.

#### § X.—*Incision.*

Like all other cysts, synovial ganglions may be treated by simple incision. Fabricius ab Aquapendente had already obtained cures by this operation, which is also extolled by Portal (*Hist. Anat.*, t. II., p. 227) and Schmucker (*Bibl. Ch. du Nord*, p. 21.) Nevertheless, practitioners of the present day do not resort to it but with repugnance. All the dangers imputed to irritating injections, are equally applicable to this. It produces, in fact, one of two things: either the small wound immediately shuts up without causing inflammation, and then the tumor soon reappears, or the interior of the ganglion becomes inflamed and is transformed into abscesses, and in this case we have reason to fear the extension of the phlegmasia under the form of phlegmonous erysipelas to the sub-cutaneous cellular tissue of the neighborhood, and even to the articulations that are situated nearest

to the tumor. The force of these objections cannot be denied, and in this respect the incision is certainly more dangerous, without being more efficacious, than irritating injections. Without inflammation it cannot succeed; with inflammation it causes pus, and purulent inflammation, in the vicinity of the articular synovial cavities, is always a formidable phenomenon. I would not, therefore, employ this means but for synovial cysts of a small volume, and for those which in place of matters purely serous, are filled with substances of a gelatinous (*gélatiniforme*) and semi-concrete character. I nevertheless admit, that the simple incision sometimes succeeds, and that it is far from being always attended with the dangers of which I have just spoken. As for the rest, I should prefer, should I decide upon it, to divide the tumor through and through, rather than limit myself to incising it only on one of its points.

### § XI.—*Extirpation.*

The remedy which has the greatest certainty, and which in every epoch has engaged the attention of practitioners, is extirpation. There is no doubt in fact that it is the most positive resource, and which precludes all chance of a return of the disease when applied to synovial ganglions. Unfortunately it is a remedy which alarms most patients, one also whose employment is not always devoid of difficulties and which may involve serious dangers. Thus to extirpate a cyst of this description, it is necessary to lay it bare by a simple, a semilunar, a T, or a crucial incision, then to go through a delicate dissection in order to isolate it from the organs which surround it, and thus remove it entire. The operation may in consequence be long, painful and sufficiently laborious. There results from it, moreover, a considerably large wound, whose suppuration it is often impossible to prevent. Finally, by operating in this manner we run the risk of opening into the synovial and articular capsules, and thus paving the way for the introduction of purulent phlegmasia even into the interior of the joints. It is nevertheless true that the dangers of this extirpation have been greatly exaggerated. I have performed it four times on the dorsum of the foot for ganglions which were of the dimensions of the thumb in diameter, a French chesnut, (*marron*), a large nut or the half of an egg. The cure in three of my patients was speedily accomplished. The fourth, who was a young girl of nineteen years of age, continued to be threatened with a phlegmonous erysipelas during the space of a week; but sanguineous emissions and topical emollients put a term to the accidents, and the cure notwithstanding was completed at the expiration of three weeks. I have removed similar cysts from the inner as well as the outer side of the knee. I have extirpated one also which was situated immediately above the head of the fibula. I have treated them many times in the same way on the dorsum of the carpus and metacarpus, and out of twelve or fifteen operations of this kind which I could enumerate at the present day, there is not one of them that compromised the life of the patient. After the example of Celsus and Paul of Egina, so also have Warner, Gooch, Eller, Schmucker, (S. Cooper, *Dictionary*, t. I., p. 526,) and Heister, (*Thèses de Haller*, t. V., p. 262, French translation,) related successes obtained by means of extirpation, an operation which

Chaumète, (*Enchiridion*, etc., p. 123,) and Friesse, (*Thèses de Haller*, t. V., p. 243, French translation,) equally eulogize. In 1800, says M. Champion, when I was studying medicine, I extirpated in a young coquettish woman, a ganglion of the size of an almond, situated on the extensor tendon of the middle finger of the left hand. An inflammation supervened and gave rise to three abscesses. After the cure the young lady retained a stiffness in the movements of the hand, and this lesson has taught me not to repeat the operation. Nevertheless, a young physician of my acquaintance, adds the same practitioner, has extirpated one of less size, also situated on the metacarpus, and which I refused to operate upon, preferring to wait until it should become larger that I might burst the cyst; but no accident followed the operation. Synovial cysts situated on the thumb, carpus and tarsus, have also been removed without danger by M. Pl. Portal, (*Clinica Chir.*, pp. 298, 301, 303, 307.) I would however remark, that I now regard it superfluous to dissect such tumors with so much care; that I arrive at the same result with infinitely less difficulty or pain to the patient by confining myself to opening or cutting freely into the whole sac, which I immediately fill with balls of lint to induce it to suppurate, and afterwards treat it in every respect as an abscess. The operation is then remarkably simple, and I have satisfied myself that it will obtain a cure as prompt and certain as extirpation of the cyst, properly so called. As to the *ligature*, it is unnecessary to repeat that pediculated synovial cysts only would allow of its employment, and that it would expose to more pain and danger than any of the operations which have been described, especially the irritating injections, without being attended either with their advantages or simplicity.

#### § XII.—*Recapitulation.*

To sum up, therefore, synovial ganglions when it is deemed advisable to attack them seriously, should be treated by topical resolvers when they are still recent; by temporary blisters when they are already of ancient date; by permanent compression where the blister and dissolving pomades are without effect; by crushing with the thumb or mallet where ordinary compression does not suffice; by sub-cutaneous puncture where crushing is unavailing or inapplicable; by iodine injections, by preference wherever they are practicable; and by large openings or the complete incision in cases that are most obstinate or complicated. So that I reject as useless or dangerous, extirpation, simple incision, caustics, the ligature, and even vinous injections.

#### ARTICLE V.—OSSEOUS CYSTS.

We find in the annals of science some cases of tumors composed of osseous shells, in other respects independent of the bones and periosteum, and containing matters sometimes concrete, at other times liquid. I have met with these tumors on the breast, scrotum and shoulder, on the parietes of the thorax, certain regions of the cranium, and on the face and limbs. M. Tassery (*Annales du Département de l'Eure*, pp. 219, 220, 1810,) speaks of a cyst with osseous walls, which was situated on the hand, and which contained



about two pounds of cartilaginous substance, and the exsection of which was effectually accomplished by means of a saw. The osteo-fibrous tumor removed from the cheek of a young man by M. D. Lasserve (*Cas de Chir.*, &c., p. 27), caused the wounding of the canal of Stenon, and appears to have originated in the salivary duct. M. D. Lasserve (*Ibid.*, p. 41, fig. 4) has also given the figure of an osseous tumor which was as large as an egg, and while disconnected with the osseous system, occupied the middle of the upper lip of a young man aged twenty-five years. It will be however when treating of tumors of the face and breast, that I shall speak of the operations applicable to this description of cysts. I will remark here only in respect to general rules, that excision and extirpation are the only operations applicable to such tumors; and that we ought consequently to proceed in the same manner for their removal as for the extirpation of a lipoma, lymphatic tumor, neuroma or hematic tumor. It is moreover obvious, that topical applications, the seton, compression, injections, and excisions, properly so called, could have no chance of success, and that before every other consideration the osseous or osteiform plates should be removed in their totality, if we expect to obtain a radical cure in patients who have these osseous cysts.

[One of the most remarkable *osseous* formations but *not* of this description, occurred in an old man aged about 75, a sailor, of tall and robust form, and a patient at the Seamen's Retreat while I conducted that establishment. He was of intemperate habits, and the result of his indulgence in this respect was one of those old *rum legs* or extensive œdematous ulcers on the calf and below, which served as a drain to his plethoric condition. In a fit of depression of mind he threw himself from the piazza of the third story of the hospital, and thus caused immediate death. In the dissection, besides various extravasations which it caused in the brain, *every rib* on one side was fractured, and on examining the diaphragm we found in its substance near the centre, a *circular osseous plate* precisely of the size and thickness and shape of a dollar, which lay in the same horizontal plane with the diaphragm and in the midst of its tissue, as if inserted or sewn into that part. It did not appear during life that this formation had in the least interfered with the respiratory functions. T.]

#### [CARTILAGINOUS AND OSSEOUS TUMORS.]

*Mediastinal Tumors—Carcinomatous-cartilaginous Tumors.*—An extraordinary case of this kind, and of which the specimens are preserved by Mr. Adams, and were by him laid before the Pathological Society of Dublin, occurred in the practice of Dr. Cullen of that city, in 1839 (see *Dublin Review*, 1840), in a woman aged 40, who had been married two years but was without children. She had had for some time great difficulty of respiration, with violent but *dry* cough, and especially paroxysms of suffocation at night. The bruits of the chest were normal. The left hand and face were œdematous, and the veins of the neck and face livid and distended during the violent paroxysms of coughing. In three or

four weeks the left arm, and then the right, and finally the lower limbs also became œdematous. Finally, she was obliged to sit up constantly to get breath, and the neck began to swell enormously and to become inflamed immediately above the sternum. Death soon followed, when there was found in the situation of the thymus, in the anterior mediastinum, an oval whitish tumor near three inches long, of a carcinomatous structure, and in some places cartilaginous and cerebriform, which tumor inclined at its largest extremity to the left, and was adherent in part to the trachea and arch of the aorta. The inclination of the tumor to the left causing it to press on the vessels of the neck and shoulder on that side, explained why the œdema was greatest in that region. The heart, aorta and pulmonary artery were sound; also the air passages and lungs, except that the latter were emphysematous, no doubt from the continued violent paroxysms of coughing. This instructive case shows the importance of tumors in the thorax as connected with the difficulty of diagnosing substernal and thoracic aneurisms and pulmonary disease.

A still more remarkable case of tumor in the anterior mediastinum was published the same year as having occurred in the practice of Dr. J. M. Neligan; (*Edinb. Med. and Surg. Journ.*, April, 1840,) in a man aged 21, who in April, 1838, was attacked with difficulty of respiration, cough without expectoration, slight pain in the chest, &c., as in the above case. Finally, a tumor showed itself above the sternum, and the symptoms became aggravated, with orthopnea, swollen veins of the face and neck, suffocating paroxysms, and cold extremities, ending in death in less than a month from the attack. The lungs, bronchi, and trachea, were, so to speak, perfectly sound, and also the heart and its vessels, and some transparent liquid was found in the pleural cavities. We perceive the thoracic viscera were sound, notwithstanding the tumor had the enormous magnitude of 14 inches in length and  $4\frac{1}{2}$  inches in breadth, and had filled the entire anterior mediastinum, with firm adhesions in front to the posterior side of the sternum, and behind to the pleura and pericardium, while above it crowded the thyroid gland upwards and had even contracted firm adhesions also as far down as with the diaphragm below, and had extended laterally on each side to the articulations of the cartilages with the ribs. This case still more strongly points out the importance of close discrimination in diagnosing morbid structures in the thoracic cavity.

*Cartilaginous Tumors of the Face and Scalp.*—But one of the most singular complications of tumors perhaps on record, is that of an unmarried woman, aged 52, as related by Mr. Ancell (*Medico-Chirurgical Transactions*, vol. XXV., London, 1842, 8vo. See also *British and Foreign Medical Review*, Jan. to April, 1843, vol. XV., p. 153, 154.) The disease first appeared when she was 14 or 15 years of age, and the greater part of her *face and scalp* was loaded with *solid tumors* of different sizes. Those on the scalp externally were of a very florid color, smooth, glassy, and denuded of hair, and varied in shape from a nearly globular, to an irregular, flattened spheroidal form; among them were a few perfectly round and of a violet hue. Some were sessile on broad bases, others suspended by

short thick peduncles. One of these latter was removed, and when divided showed a smooth shining semi-transparent texture of a very *pale pinkish hue* and of a *nearly cartilaginous* consistence. It appeared homogeneous except for a few vessels ramifying through it. The investing skin was much more vascular. Among those on the face were interspersed also a number of lenticular tubercles arising from hypertrophy of the dermis, and some also smaller which were follicular elevations. The tumors sometimes itched and were painful when pinched, but were generally free from uneasiness. At one time a few were extirpated, and subsequently Mr. Bryant *removed sixty at one sitting!* They were then not cartilaginous and could easily be enucleated. Within twelve months from the operation they were all reproduced. This most singular disease invaded finally the viscera, and a large tumor appeared to have formed in the abdomen, which was followed by ascites, anasarca of the lower extremities, and death. On examining the body the peritoneum was found opaque, but with a shining surface. “The *parietal portion* (says the account) *and the lining of the diaphragm were studded with myriads of tumors of various sizes.*” The fat of the great omentum was almost entirely absorbed, and its tissue sprinkled over with numberless granules. A large mass weighing almost two pounds was suspended from the anterior edge of the liver; it extended beneath the right lobe, displacing and depressing the gall bladder. It was of ovoid and irregular form, and of very firm texture. On dividing it the tints of the cut surface were extremely varied, green and greenish yellow predominating, while the centre was nearly white and almost cartilaginous, and exhibited radiating fibres and lobules of an indistinct cystiform aspect. Blood oozed on pressure from a good many red points, but the tumor could not be called highly vascular. The disease appears to have been hereditary, but was confined to the *females* of the family, who were also remarkably prolific. A pullulating diathesis and tendency to fibro-cartilaginous growths appears to have pervaded the entire organism.

Mr. Goodsir (Cormack's *Lond. and Edinb. Monthly Journal*, &c. Feb. 1843, p. 171.) has removed from the compact bone of the shaft of the humerus on its outer side, an enchondromatous tumor of the size of a billiard ball, which was lobulated and of compact cartilaginous texture externally, and had internally masses of exceedingly hard bone, imbedded in soft cartilage. It bore the appearance of similar enchondromatous masses found in the phalanges of the fingers. T.]

[GANGLIONIC, SEROUS, AND SYNOVIAL TUMORS AND CYSTS—BURSÆ  
MUCOSÆ ET SEROSÆ—IODINE INJECTIONS.

*Encysted Hydropic Tumors between the duplicatures of the Peritoneum cured by Iodine Injections.*—Not only has the successful treatment by *iodine injections*, as established by M. Velpeau, been generally adopted in Europe for synovial tumors or hydrocele, but also, so long as six years since, was boldly applied by M. G. Pagani, Surgeon-in-Chief of the Hospital of Novarre in Italy, (see *Annali Universali di Medicina*, Fasci 296, Agosto, 1841,



also *Journ. des Connaiss.*, &c., de Paris, Fevrier, 1842, p. 84,) to *hydropic encysted collections*, which apparently existed between the *duplicatures of the peritoneum in the hypogastric region*. The case in question was that of a man from the country, aged about thirty-two, in whom a rheumatic fever of short duration and accompanied by much dysuria, and finally a sort of dysentery, was soon succeeded, in spite of copious bleedings, purgatives, &c., by the rapid formation of a large encysted tumor in the hypogastric region. An exploration by the cataract needle and trochar enabled the surgeon to draw off a small quantity of fluid very similar to that of ganglionic capsules, [i. e. *bursæ mucosæ*, or more properly *bursæ serosæ*, see remarks of M. Pétrequin under this head, *infra*, T.] which with an examination per anum, and the introduction of the catheter into the bladder, and evacuation of its urine, led to the diagnosis that the tumor was circumscribed by the enormously distended layers of peritoneum where it is reflected on the posterior part of the bladder and anterior portion of the rectum. The surgeon accordingly, keeping in view the analogy of tissues to the tunica vaginalis, and the cures he had obtained by injection of the alcoholic tincture of iodine in hydrocele, introduced into the abdominal cavity in question, by means of the canula and syringe, through the puncture he had previously made, two fingers' breadth above the pubis, and two inches to the left of the linea alba, a diluted preparation of the same material. A very moderate degree of warmth and reaction was felt by the patient, and in five days the tumor had entirely disappeared, followed shortly after by the cure of the dysenteric affection and perfect restoration of health. It would be worth while to ascertain how far this treatment could be employed with utility in ordinary ascites, ovarian dropsy, &c. We have already spoken of it (see Vol. I. and the present vol.) as successfully employed in the mouth of the sac in reducible hernia, after the taxis.

M. Pétrequin of Lyons, in an article on synovial tumors, (*Journ. des Connaiss.*, &c., de Paris, Juillet, 1842, p. 10, et sequ.) in passing a compliment on the labors of MM. Monro, Brodie, Ollivier, Lenoir and Velpeau, disapproves the phrase *bursæ mucosæ* as altogether capricious and erroneous. These tumors occupy serous, not mucous capsules, and he has marked their whole progress, from their inception as simple hydropical collections, through the several successive stages of sub-acute inflammation, hematocele, abscess, ulceration, chronic induration, &c. M. Pétrequin reverts to a treatise he had published many years since, that on *exsections of the lower extremity*, and again enforces the necessity of early exsection of the great trochanter, and saving of the leg before the exfoliation caused in that process, by inflammation and improper treatment or opening of the sub-cutaneous *bursa* situated over that prominence, shall have involved the coxo-femoral articulation; for lesions of which last there is reason to believe these implications of the trochanter from the disease in the superposed bursa, are too often mistaken. The more important does this advice become, because the affection of the trochanter produced in the manner mentioned, may extend to the joint itself.

In ante-patellar bursa, (hygroma prérotulien,) M. Pétrequin has seen one of four inches diameter in the direction of the axis of the

limb, and three inches laterally, which had existed two years, and which Dupuytren himself had in vain endeavored to cure. These bursal tumors often result from traumatic contusions, and then contain bloody, grumous, and sometimes *fibrinous* matter, which latter M. Pétrequin considers the original cause (or nuclei) of foreign bodies about the joint, i. e. spontaneous or amphi-articular bodies.

These tumors, arrived at this condition, communicate, on pressing them, a sensation of movement, (*frémissement*.) leading to the idea of the existence of semi-cartilaginous corpuscles or of hydatids rubbing against each other, all which can be explained by the existence of fibrinous concretions, or the crushing together of sanguineous clots. (See M. Velpeau's remarks on these bloody tumors sup. and in Vol. I.) He places, erroneously, as we think, some reliance on resolvents, (such as muriate of ammonia,) and on compression, &c.; but where these fail, he has found, like M. Velpeau, a cure effected by iodine injections, and should the contents of the sac be solid, an incision becomes necessary.

M. Pétrequin errs also, as we know from experience, both in olecranian and ante-patellar bursæ, (see in this note below, and also sup. and Vol. I.) in supposing that *bursting* them by strong percussion will not succeed if they have existed over a year. It is the remedy, as we conceive, *par excellence*, and next to that comes iodine injections.

His remarks, with great appearance of sound practical reflection, that such *ante-patellar* hygromas, when they suppurate and infiltrate into the neighboring tissues, might well give rise, by the tumefaction they produce, to the supposition of an inflammation and effusion into the tibio-femoral articulation.

These *sub-cutaneous, cellulous, serous bursæ*, as M. Pétrequin properly considers synovial bursæ, so called, are found, or may in fact be *accidentally* produced over all osseous prominences where there is much traction and friction of the superincumbent tissues, particularly therefore, it might be added, near the articulations. He has seen them at the inner *malleolus* also, becoming ulcerated and forming there pseudo-mucous fistulæ, like those which may result from abscesses. Such are cases in point for the iodine injections.

Besides *tibial bursæ*, as those on the internal malleolus may be called, M. Pétrequin has seen also *fibular bursæ*, i. e. on the outer malleolus. In cases like one he saw, and which resulted in caries to the fibular extremity, he properly recommends exsection of this part, which can readily be done without implicating the joint. These fibular bursæ are not uncommon among *tailors*, from their habitual position while at work making pressure on the outer ankles.

M. Sédillot speaks of *calcanean bursæ* (i. e. at the heel,) as new, or at least as hitherto undescribed by authors. That they have long been familiarly known, is an undoubted fact, but in most cases probably confounded with corns, to which they bear a resemblance at first. M. Pétrequin has described them in his usual clear and condensed manner. The epiderm forms a blister or phlyctena, and the subdermoid tissue is thickened like a large flat callosity or corn, and separated from the parts below. From this space oozes a serous watery discharge, the parts becoming more and more inflamed and exceedingly sore and troublesome. He says ulcerations and impli-

cations of the os calcis might ensue if such cases were neglected. Tight boots are the common cause, and the bursa is probably then an accidental production.

A very similar affection, which is not uncommon, (and which I have several times seen under the great toe,) explains, M. Pétrequin remarks, the existence of a *sub-metatarso-phalangeal* bursa in this part. This I treat by poulticing at first, and after the reduction of the inflammation, careful excision horizontally of the horny plates down to the sound parts, when a strap or two of adhesive plaster firmly bound round the toe and foot inclusive, readily completes the cure.

M. Pétrequin has seen a bursa similarly situated under the little toe, and considers also that a *bursa* exists *under* the heel, also on the lateral portion of the metatarso-phalangeal articulation of the great toe, where he has seen them cause much pain and inflammation, ending in suppuration, and passing thence into *chronic induration* of the capsular walls, giving the appearance of an enlargement of the extremity of the metatarsal bone. These also, we think, are sometimes mistaken for corny callosities; though most probably a great number of corns or callosities so called, about the small joints of the toes particularly, are in reality enlarged bursæ, from pressure of tight shoes, and therefore more common in females. The lateral bursæ at the toe go by the name of *ognons* in France, (see Vol. I. and Vol. II., under Corns, &c.) *Soft Corns*, so called in this country, and which form between the toes near their commissure, and which from their position become less frequently indurated, are also probably natural or accidental bursæ, inflamed by tight shoes.

M. Pétrequin has seen an inflamed encysted lateral metatarso-phalangeal bursa on the great toe in a man, acquire the size of an egg. It was red and fluctuating, and seemed to involve the natural bursa which exists above, and the one also below the articulation. On opening it pus and blood were discharged, after which a cure was effected by iodine injections. In one case the matter evacuated was gelatinous.

We do not wonder that M. Malgaigne, (see 4th edition of his *Manuel de Méd. Operat.*, Paris, 1843, p. 113,) could not succeed by Sabatier's inefficient mode of rupturing these bursæ, by slow pressure of one thumb over another. Sudden and strong percussion, as with a bound book, noticed by M. Malgaigne, is the only sure mode of making this process successful. (See our remarks *infra*; also on the same subject in Vol. I. of this work.) Certainly this mode could not succeed where there is no point d'appui, as when these tumors, according to M. Malgaigne, are found, (though extremely rare,) between the os hyoides and thyroid cartilage. Where they are met with, however, on the dorsal surface of the hand over the interosseous space, between the metacarpal bones, as we have said above, it would not *even then* be difficult, as it appears to us, to crowd them on to the adjacent metacarpal bones, and burst them in this position.

M. Malgaigne's own process in fact is nothing more than the sub-cutaneous principle of M. Guérin, and M. Goyrand of Aix, &c.; i. e., he draws the bursa forcibly to one direction, makes a small sub-cutaneous puncture into one extremity of the sac, evacuates the sy-



novia or small cartilaginous bodies if they exist, and then with the blade of the instrument sub-cutaneously breaks down effectually the walls of the bursa, after which he makes for 10 or 15 days strong pressure with flat pieces of agaric and thick compressions, (loc. cit., p. 113, 114.) This process may undoubtedly answer where percussion fails.

In encysted *tumors*, developed in the cellular tissue, containing collections of serosity or other liquids of greater consistency, as pus, &c., M. Récamier is in the practice (op. cit. Malgaigne's *Manuel de Méd Operat.*, 4th edition, Paris, 1843, p. 113) of evacuating a portion of the pus, &c., little by little, and replacing this portion by injection of warm water, until the walls collapse and adhere, in the same way as he does for abscesses by congestion.

M. P. J. Cabaret of Saint Malo, (France,) in a memoir on bursæ mucosæ, (*Journal des Connaissances Medico-Chirurg.*, Paris, Juin, 1844, p. 224—228,) after noticing the almost total neglect which had been evinced towards them until the time of Bêclard, (*Additions à l'Anatomie de Bichat*, 1821,) states that these bursæ form a roundish (obronde) cavity, divided by imperfect septa, (coloisons incomplètes,) but without any opening; that in their texture they appear to be membranes, differing only from cellular tissue by being more condensed and composed of large laminæ (en grandes lames); their evident design being [like cushions or pulleys, T.] to give greater ease to the movements of the bones under the skin. For which purpose their homogeneous smooth surface is slightly bedewed with an unctuous mucilaginous liquid. Most anatomists concur in the opinion that they are less numerous in children than in adults, because their development depends on muscular movements. M. Velpeau has noticed them on both sides of the spine, on the malleoli, and on the outer, posterior, and middle part of the thigh. I have seen them also in one case (the result of syphilis) directly over or upon both the great trochanters, easily movable, elastic, somewhat painful, elliptical in shape, and thus buried deep under the muscles and aponeuroses, as hard to the touch as a stone, and of the size of a pullet's egg, but totally disappearing spontaneously under the proper internal remedies for the constitutional disease to which they appeared to owe their origin. They are most usually found accidentally developed in consequence of unreduced fractures and luxations, and Sir B. Brodie has seen one of great size in the case of a girl with Talipes Equinus, and which formed upon the part of the instep upon which she walked. (*Pathological and Surgical Observations on Diseases of the Joints*, London, 1818.) The excessive secretion from their internal surface may distend them into elastic tumors, truly *hydropical* in their character, as our author, M. Velpeau, in a recent valuable memoir, has very properly considered them. (*Recherches Anatomiques, Physiologiques et Pathologiques sur les cavités closes, naturelles ou accidentelles de l'economie animale*, 1843.) Others have on that account invented for them the name of Hygroma, which is adopted by the writer, M. Cabaret, whose treatise we have under consideration. M. Cabaret remarks that these serous bursal tumors are found in all parts of the body, but more especially at the elbow, [see notes on this subject in Vol. I. and inf.,] the

knee, [vide same notes, T.] in front of the patella of individuals who rest frequently upon this part, such as preachers, religious persons, washerwomen, slaters, tilers, thatchers, &c., &c. In England, from the more rigid division of society there for centuries into certain casts or permanent occupations from one generation to another, more opportunities of course present for noting what may be considered the accidental products or results of such professions or occupations. Hence we hear there, and see surgical descriptions of these enlarged bursæ under the familiar names of the *miner's elbow*, the *housemaid's knee*, and the *scrivener's palm*, &c. Sir B. Brodie has known this disease to be hereditary.

These tumors are, as might naturally be conceived, more or less dense or elastic, more or less distended, and of greater or less volume, according to the greater or less pressure, constriction, motion, &c., of the surrounding parts. While not in a state of inflammation, the contained fluid continues to be analogous to synovia; when arising from contusions, blood may be effused, giving a reddish or brownish or black color to the synovia. They then may be said to constitute a natural *hæmatocele*, the same as happens in the cavity of the tunica vaginalis testis, or as some now call it *peri-testis*, in which case they present the most favorable circumstances for M. Velpeau's treatment of bloody tumors by percussion, [see Vol. I. supra,] or puncture and iodine injections, more lately advocated by our author. [See sup.] Fibrinous clots, says M. Cabaret, or a sort of transparent *bouillie*, are sometimes the result of the alterations which the blood undergoes in these tumors. At other times the liquid they contain is mingled with a number of movable bodies of a flattened oval form and deep-brown color, and in appearance resembling melon seeds. These small masses, which are at first albuminous and movable, progressively acquire a great degree of hardness.

M. Cabaret rejects every kind of local application, of frictions, lotions, unguents, &c., whether iodine, mercurial, saturnine, or otherwise, and also doubts the value of compression and temporary blisters, which have succeeded with M. Velpeau.

Excision of the tumor in whole or in part is also generally proscribed. M. Velpeau has seen two cases of death from this operation, (see *Archives Gén. de Méd.*, Paris,) and Mr. Keate has seen the disease return in a case in which he believed he had thus extirpated it. Sir B. Brodie recommends it only under certain restrictions or qualifications, which according to M. Cabaret are where the bursa has become fibrous, thick, disorganized and incapable of resuming its normal condition.

Simple incision is of no avail, as we all know, against a return, and the consequences, such as intense inflammation of the surrounding tendons, sheaths, and muscular tissues, abscesses, phlebitis, &c. are often of the most formidable character, which are likely, as we consider, to be aggravated by the former practice of introducing a seton into the cavity thus opened. This mode of provoking agglutination of its walls we deem too severe, of which opinion we find also M. Cruveilhier.

Puncture of the hygroma and injection of a moderately stimulating liquid, as for example, the iodine injections which have proved so

successful in the hands of M. Velpeau, is, according to M. Cabaret, deserving of adoption as a general method of cure for this disease

M. Cabaret, in illustration of the success of this treatment, presents five cases, four of which were bursal tumors on the patella and one on the olecranon, and all of which were perfectly cured by puncture and injections of wine and water, diluted tincture of iodine, &c., causing in a few days complete agglutination of the walls without any serious degree of inflammation. We should suppose that for the puncture an extremely delicate trochar, not much larger than an exploring needle, would be most advisable, rather than an ordinary trochar or bistoury.

In conclusion, M. Cabaret says: The three last cases (two of the patella and one of the olecranon, and in which he injected the iodine) which I have just given, and many others which I possess, furnish incontestable evidence of the truth of the law laid down by M. Velpeau, in the following terms: that "we should cause to be produced in shut cavities containing effused fluid, an irritation which should be constantly *adhesive* and never *purulent*." These cases, adds M. Cabaret, will, I trust, help to make us feel the value to be derived from the treatment of hydropsy of the sub-cutaneous synovial bursæ by *iodine injections*, as administered according to the method of the learned professor of clinical surgery at the Hospital of La Charité.

Nevertheless, as we have before expressed ourselves upon this subject in various places in the text of this work, we must with all due deference to the importance of the facts above adduced, and of the unquestionable value of the treatment proposed and so successfully pursued by M. Velpeau, confess that we should in all cases where it is practicable, and where there is but little or no serious pain or inconvenience in the tumor, be the tumor of what size it may, (provided it has not, from its long standing, undergone the kind of fibrous consolidation spoken of,) prefer *sudden and powerful percussion*, as we have described it.

The distended, rolling bursa is then instantly broken up into fragments, if the stroke is made from a considerable height and with great force and rapidity, as by a heavy book or something similar, held in the operator's hand, while the patient is unaware of your intention and has his head turned away, and arm or leg firmly supported upon a table. Thus have I perfectly succeeded in a large olecranal *bursa*, which had been growing for a year or more in H—, a healthy mulatto (part Indian and part white) of sound constitution and good habits, and aged about 35. The patient, who was confidential porter of a distinguished mercantile firm of this city, finding the tumor at length had attained such dimensions, being oval shaped and of the size of a small hen's egg and exceedingly tense, though elastic, as to give a considerable degree of pain and annoyance in the use of his arms in hoisting and carrying boxes and bales of goods. He had imagined his arm would have to be *amputated*, and having promised, if it should be found necessary when I should examine it, (for I had not yet seen it,) that if so serious an operation as amputation was required it should be performed, I sent word to him to call upon me, and in that event I would give him a note to an eminent surgeon, who would do it at his clinique at



the University. Immediately on looking at it I perceived it was nothing more than a bursal tumor, and as there was nothing to prevent proceeding at once to the mode of cure I have mentioned, I asked him to stretch his arm out in pronation firmly upon the table, and to turn his head away. Having at this time purposely in my hand a heavy quarto volume which I appeared to be engaged in perusing, I suddenly came down upon the enlargement with it, holding it in both my hands, with all my force, from an elevation of three feet, striking such a blow upon it as dispersed in an instant every vestige of disease. To the patient it naturally seemed *marvellous*; and in fact would have appeared to be such in the eyes of most persons out of the profession. If an operation of this kind, so instantaneous, so bloodless and painless too, it may be said, (for the pain is but momentary,) and yet so radical in its total extirpation of the disease, was known to the school of Esculapius, we cannot wonder why the ignorant, marvel-loving, superstitious multitude, before whom this master spirit could have turned such skill to a valuable account, (by momentarily taking the patient for a few instants out of their presence,) should have deemed him more than mortal, and built altars and temples to his honor.

Far be it from the writer of this, however, to glorify himself on such an achievement, so long as its common utility and the facility with which any person may perform it, are so obviously sustained on the plain principles of common sense.

The truth and efficacy of this treatment, and its total protection from all return of the disease or any accident whatever, had been made manifest to me many years since, during my residence at Nassau, in the Bahama Islands, in effecting the same results for bursal enlargements upon the *wrist*. Besides the remarkable case of that on the olecranon just mentioned, I have since performed the same operation on another patient, also a laboring man, and on whom the tumor was situated in precisely the same locality; but in this last patient, from not having had it in my power to strike a full and perfect blow at first, I was obliged to repeat it a few days after, when the cure was complete, and has remained so now in both the individuals (whom I am frequently in the habit of seeing) for several years.

In another case there was a hemispherical sub-cutaneous bursal tumor of great size on the patella, full equal in dimensions to the half of a large orange, and completely covering the patella like a large inverted cup. This man, as the porter or wine-marker of a wine vault in the largest hotel in this city, was in the constant necessity of being upon his knees. I effected a partial cure and subsidence of the tumor for a year or more by producing, by means of common strong ammoniacal liniment, a copious suppurating drain over its whole surface for weeks; but ultimately was obliged, about three years since, to come to *percussion*, which was performed as mentioned, and which effected, as he informed me within a few months past, a radical and permanent cure.

It is unnecessary, perhaps, to say more than we have already said in the first volume on the new mode of curing bursal tumors by breaking them down (as in couching the lens in cataract) at the point

of a narrow tenotome, introduced sub-cutaneously at some distance from the tumor. The cures effected by this process, appear to be well substantiated, (vid. Vol. I.) and we have had no evidence (at least no published evidence) of its failure in any case. *A priori*, however, it would be deemed an operation of too great severity, but for these successes, and others of a more remarkable kind, by the same process, in extracting foreign bodies from the knee joint, and the practicability of which M. Velpeau himself has recently confirmed (vid. Vol. I.) by the sub-cutaneous extraction of a ball from the same articulation.

The successful treatment of enlarged *bursæ mucosæ*, by injections of *tincture of iodine*, as some years since introduced into practice by the learned author of this work, M. Velpeau, has, we are gratified in perceiving, been recently verified in a most satisfactory manner, by experiments performed for the same disease in horses. At the sitting of the Academy of Sciences of Paris, March 24, 1845, (see *Gazette Médicale* de Paris, Mars 29, 1845, tome XIII., p. 204, 205,) MM. Thierry and Leblanc communicated the result of their experiments upon this subject, made in presence of MM. Velpeau and Rayer. It is known, say MM. Thierry and Leblanc, that horses are often affected with dropsy in the articulations and mucous passages (les courses muqueuses), and which are described by veterinary surgeons under the name of *wind-galls* (molettes) and vessigons. Up to the present time, one remedy only has been employed for this affection, namely, the red hot iron, applied either in the shape of the rayed or the pointed cauteries. But whatever were the means used, injurious traces of the disease always remained behind. It was with the view of obviating this inconvenience, that the authors, guided by the researches of M. Velpeau, made experiments with iodine and vinous injections as compared with the application of the hot iron. From the results they obtained, they believe themselves authorized in declaring that iodine injections in the mucous bursæ and synovial sheaths, in horses, may advantageously replace cauterization by the red hot iron, and that in a plurality of cases, this mode of cure ought to be first employed.

We have upon the strength of well-attested recorded facts, considered the discovery of the mode of effectually curing these ancient *opprobria*, by the new system of *sub-cutaneous puncture*, so important and valuable, that we have been thereby in some measure compelled to anticipate our author in the position to which he has assigned this subject in the French edition of this work. As the cure of these bursal tumors, which have hitherto so much annoyed, as well as baffled, our art, except where the patient and surgeon together, have had the courage to adopt the ancient, and after all, when the case warrants it, the most radical process, (we mean *sudden percussion*,) is the most important point to be considered in relation to them; we have, in consequence, said most of what we had to add on that subject, under the head of sub-cutaneous surgery, in our first volume. Though incisions and setons in these natural bursæ, enlarged morbidly into painful encysted sacs, (the most inconvenient cases of which are those in working men, as those familiarly known in Eng-

land, as the *maid-servant's knee*, the *miner's elbow*, and the *scrivener's palm*.) have been for the most part abandoned for the tenotome, several surgeons, nevertheless, among them our author, M. Velpeau, continue to adhere to his process. M. Velpeau's mode consists in a simple puncture with the trochar, to evacuate the *hydatid corpuscles*, which step is deemed indispensable to the cure, after which he makes use of free injections of diluted tincture of iodine, after the present received mode of treating hydrocele, in order to stimulate the sides of the sac to agglutination. M. Velpeau has met with most signal success by this course, and obtained speedy cures, free from all accidents. (*Ann. de Therap.*, Paris, April, 1845—also Cormack's *Lond. and Ed. Month. Journ.*, June, 1845, p. 460, &c.) M. Chassaignac (*Ibid.*) in a remarkable case of one of these tumors in the wrist, found that from its great size, twice that of an egg or orange, it was compelled by the annular ligament of the wrist to assume a *bilobate* form, about one half being above the ligament, and the rest in the palm of the hand. The large quantity of hydatids evacuated by the trochar were found by M. Chassaignac to be true species of that enzootic class, possessing, as examined by the microscope, elastic, compressible, *vesicular bodies*, and not composed of those hard, albuminous concretions which are mistaken, he says, for them.

M. Gherini, surgeon of the great Hospital of Milan, (*Ib. and Annali Universali*, Jan., 1845,) saw also a *bilobate* bursal hydatid cyst on the posterior part of the *elbow*, though that has no annular ligament to explain this form, and cured it by incision, evacuating 52 barley-shaped corpuscles. The sac suppurated, but the cure was complete. Neither of the lobes of the bilobular cyst communicated with the articulation. We should for ourselves be adverse to the incision in any case except in one of extreme necessity, as, for example, where there was great extent of inflammation in the cyst and neighborhood, from bruises, injuries, &c., and then the knife should be withheld until general and topical depletion had reduced the violence of the inflammation and attending fever, if any, and that the distension of the sac by the contained synovial or hydatid matters had made it necessary. But a mere small sub-cutaneous incision in such cases, and sufficient to evacuate the contents, is a very different thing from an extensive dilatation of these cavities themselves, while they are in an uninfamed state. The incision practised in this latter state, from the exposure to the air of the peculiarly sensitive tissue of these bursæ, becomes itself, by the operation, the source of danger, whereas in the other case, it is to subdue inflammation, that we have recourse to it. We think we are warranted by the pathological discoveries of sub-cutaneous surgery, and by the reiterated injunctions so studiously enforced by our author throughout this work on the subject of the dangerous accidents, such as burrowing, destructive suppuration, phlebitis, purulent infections, tetanus, typhus, &c., from wounding synovial membranes, surfaces, passages (coulisses) and capsules, to lay it down as a precept, that these bursal cysts must not be thus meddled with by direct incisions, except under the circumstances mentioned.



Irrelevant and improper as would be the admission into a work eminently didactic and elemental as is this on operative surgery by M. Velpeau, of all matter purely controversial, unless as in the academic discussions upon tenotomy (see Vol. I.) and those on fibrous tumors, (see this vol. *infra*.) new and valuable facts are thereby elicited, we deem it, nevertheless, an act of impartiality to state in this place, in reference to a subject already treated of in the 1st vol., (the sub-cutaneous puncture for articular dropsies and foreign bodies, &c.) that M. Bonnet, of Lyons, claims the merit, how just we cannot at present decide, (see his recent work, *Traité des Maladies des Articulations*, 2 vols. in-8° Paris, 1845, also a notice of the same in the *Gazette Médicale de Paris*, Mai 17, 1845, t. XIII., p. 319,) of having been the first to employ, and before M. Velpeau, *iodine injections* into the articulations. By a curious coincidence, however, M. Bonnet himself, in making this reclamation over the surgeon of La Charité, has in his work just cited, committed an act, (*Introd.*, p. xxxvi, and tome I., pp. 451, 487,) according to M. H. Diday, (*Gaz. Méd.* loc. cit., p. 320,) of positive injustice towards M. Jules Guérin in another matter appertaining to this subject; viz., in asserting that we owe to M. Goyrand, of Aix, the credit of having first treated the evacuation of articular dropsies, and the extraction of foreign bodies in the joints, by the sub-cutaneous puncture. M. Diday contends (*Gaz. Méd.*, loc. cit., p. 320,) that at least the germ, or original idea of this treatment, in both these classes of affections, was so specifically and formally laid down by M. Guérin, as early as in the years 1840 and 1841, (see M. Guérin's *Mém. sur les Plaies Sous-cut. des Artic.*, lu à l'Acad. des Sciences de Paris, le 4 Mai, 1840; and the *Essais sur la Méthode Sous-cut.*, Paris, 1841, pp. 84 et 113,) that there can remain not a shadow of doubt as to his (M. Guérin's) claim of priority. M. Diday, however, seems willing to make a sort of commutation of this last mentioned difficulty, by admitting that M. Bonnet may possibly be entitled to the merit of having been the first to *execute*, and *with success*, the *sub-cutaneous* operation for the extraction of intra-articular foreign bodies; but that the same operation as applied to the evacuation of the liquid of hyarthrosies, by making this fluid pass under the skin, by a sub-cutaneous incision into the synovial capsule, as practised by M. Bonnet, is not so certain and efficacious a cure as the pure and simple evacuation of the liquid, by means of the syringe, as practised by M. Guérin; the process of M. Bonnet incurring the risk of not procuring a complete evacuation, and of leaving a portion of the liquid, as an irritating substance, under the skin.

*Patellar bursæ*, or those between the patella and integuments, and familiarly known in England as the *housemaid's knee*, may, Sir B. Brodie is satisfied, be reproduced after their complete extirpation, as he has frequently found to be the fact. (*London Med. Gazette*, May, 1846, p. 829, from Sir B. Brodie's Lectures on Pathology and Surgery).

*Sanguineous Tumors treated by Ecrasement*.—The process of crushing, which we have felt it our duty to advocate in such unequivocal terms, as the one which should always be preferred, where practicable, for mucous bursæ, has been applied with eminent success,

also, in sanguineous hematic tumors that are external, and favorably situated for percussion. M. Velpeau reasoned very naturally, (*Traitement des Tumeurs Sanguines par écrasement; Annales de la Chirurgie*, Aout, 1843; *Arch. Gen.* 4e, ser., t. III., pp. 217, 218, 219,) that the extravasated blood of such tumors, if once dispersed by their rupture, so as to become infiltrated into the surrounding cellular tissues, must naturally from its assimilation to the great mass of the vital fluid, be absorbed with yet greater facility than the serous liquid of synovial bursæ. He also presents as another striking argument for the *écrasement* of such tumors, the fact, that left to themselves, in their semi-concrete and confined position, they are rarely absorbed, whereas every one is familiar with the fact that every ordinary ecchymosis or extravasation of blood from a blow or bruise, is rapidly absorbed, and for the reason, that in the latter case it is dispersed by the accident itself, into the cellular tissues. This, probably, is the source of the correct vulgar practice of applying pressure and friction immediately, and as soon as such bruises are received. The *écrasement* is performed by M. Velpeau by sudden pressure upon the tumor, with the palm of the hand or with the thenar eminence, or with both hands, or it may be done with a solid body, as a piece of money or wood, which is to be struck upon with a hammer or the fist. The tumor is broken up immediately, leaving only some lumps (*bosselures*) in the tissues. The tumors best adapted to it should not exceed the fist in size. He very judiciously adds, that a solid point d'appui must of course exist as in ordinary serous bursæ, and before the operation can be thought of. In case of an eschar on the tumor, the process may still be applied if the eschar is superficial, and has not begun to be detached; in the contrary case we should abstain. *Ecrasement* is better adapted to the effusions in accidental, than in normal close cavities, as the walls of these last are always thicker, and consequently more resistant. M. Velpeau furnishes numerous cases of cures in favor of this, as it appears to us, most judicious treatment. Surgery, it may be said, has at length obtained a tolerable mastery over external, synovial and hematic tumors, either by means of *écrasement* or sub-cutaneous injection of iodine, to say nothing of the value of this last, or favorite process of the author in normal close cavities.

*On Close Cavities in general.*—Before this chapter closes it is proper to insert in this place, and more in detail, the new and important views of our author, M. Velpeau, as published by him in his work, entitled *Recherches Anatomiques, Physiologiques et Pathologiques sur les Cavités Closes, naturelles et accidentelles, de l'économie animale*. (Par A. Velpeau, &c., Paris, 1843, pp. 208, see also an extended abrége of this in the *British and Foreign Med. Review*, vol. XVIII., July—Oct., 1844, pp. 79, 90.) M. Velpeau maintains the new proposition, that serous and synovial membranes, as distinct tissues, *have no existence*, and consequently that the notion of close cavities formed by such membranes, is entirely devoid of foundation. He bases this proposition on the facts obtained from intra-uterine life. From ten embryos examined by him, and which were from fifteen to thirty days old, he concludes that even up to the 4th week the free surfaces present no appearances of membrane; the whole body consisting

apparently, of a homogeneous, gelatiniform and fragile substance, none of the cavities any where being lined with any distinct membranous tissue, or laminæ capable of being isolated. The whole is either *surfaces* or *parenchymata*, while there is nothing either in the head, chest or abdomen, to justify the expressions cutaneous, mucous and serous membranes, &c. He contends that what for example we call in extra-uterine life the peritoneal or serous membranes do not always exist, and cannot be detached as a distinct peritoneal or serous membrane, properly so called. They are in fact only *serous surfaces* continuous with, and not separable (except by a traumatic division) from the subjacent cellular parenchyma of the organ, as on the liver, uterus, ovaries, &c. So behind the linea alba. In proof of this, it is to be considered that the *serous membranes*, properly so called, do not exist, and do not become manifest until at a very advanced period of the embryonic state, that is, prior to the organs invested by them. Pursuing the same course of reasoning in respect to other cavities than those of the abdomen, and which, however ably maintained, is too strictly pathological to be properly embraced in the text of our work, M. Velpeau comes to synovial cavities, properly so called. He shows that there are but few vestiges to be found of this supposed serous membrane. Thus, in the knee it is no where to be found, on the free surface of the cartilages, or on the internal surface of most of the ligaments.

*Accidental close cavities* are divided by our author into functional and pathological. The functional consist of: 1. Serous cavities 2. Articulations; and 3. Cellular cavities. The first, or *serous*, are formed by an ovary, a noose of intestine, or a knot of epiploon or other viscus passing through a fissure of the peritoneum and abdominal muscles, so as to fix itself under the skin. The second or *articular*, are connected with the articulations, and caused by a luxation or fracture. They have no lining membrane, and are nothing more than the polished surface of the textures which enter into their composition. The third or *cellular* cavities, are those usually denominated synovial or mucous bursæ, and are accidental sub-cutaneous arrangements, which nature interposes over any projecting point or surface of bone which is exposed to much pressure from without, and are evidently designed to protect the soft parts from the hard, in the nature of pulleys, or rather a sort of distended sacs or air cushions. Thus on the backs of porters and on the acromion of persons who carry burdens on the shoulders, on the angle of the scapula in those who carry scuttles, &c., on the anterior part of the sternum in joiners, &c., on the malleoli, [and tuberosities of the ischium, T.] in tailors, &c., on the hump of humpbacks, and on the salient points of club feet. To these we may specify those which in certain occupations in England are so common as to have acquired, as we have elsewhere frequently noted in this work, a particular designation. Thus the bursa over the patella, called the *housemaid's knee*, seen also in the other sex, and in all who have occasion to rest much on this part; so also the *miner's elbow*, meaning the bursa at the acromion, caused by the position in which the miner works. To these add the *scrivener's palm*, or bursa in the palm and wrist of those who have to write a great deal. Our author also has seen them on the body of



the clavicle, on the posterior surface of the fore-arm, on the internal surface of the tibia, the crest of the ilium, &c., from exposure of those parts to friction and pressure. All these cavities, like normal ones of the same character, are destitute of investing membrane.

*Pathological close cavities* comprehend every kind of abscess, cyst, and morbid deposit. But it is to *morbid sub-cutaneous close cavities*, analogous to the normal close cavities of joints and under tendons, that he particularly directs attention. These *sub-cutaneous morbid cavities* are observed: *a.* In the *cellular tissue*, which have been described particularly as serous cysts, and which are surrounded by the condensed cellular tissue, which is mistaken for a supposed lining membrane to the cavity; *b.* In *glandular bodies*, as in the thyroid body, breast, testicle, &c., where it is also clear that their surface is part of the tissue of the gland. The *pellicle*, which may occasionally be separated, has been formed there in the same way as that which constitutes a part of the cavity of an aneurismal sac, in which the blood has continued to circulate. In the ovaries, M. Velpeau says, the truth of his doctrine is strikingly illustrated by the coexistence of *real cysts* like hydatids and which can be readily detached from the tissue of the organ, with close cavities the surface of which is inseparable from it, and forms part of it. *c.* In *ganglial cavities*, as under the jaw in the region of the parotid, and in the carotid canals, and in front of the larynx, in the supra-sternal fossa, axilla, bend of the arm, groin, and ham, and in the interior of the pelvis. These last may exist in the gland, shut up, as it were, and with their sides in contact, or if they are towards the surface of the gland, they then, from having room, expand into a pouch, which, however, will always be found to be attached in some portion of it to the glandular mass. The practical inference from all the above is that *diseases of close cavities or surfaces* are in fact primarily nothing more than *diseases of the tissue*, of which these cavities constitute a part. From whence M. Velpeau lays it down as a law, that as the articular cartilages are destitute of arterial and venous circulation, and of a serous membrane, properly so called which is distinct from their tissues, so neither inflammation, ulcers, fungous diseases, nor transformations, nor degenerations of any kind, exist as a primary malady on the free surface of those articular cartilages. A deception may arise in this way; that inflammation without the cartilages may lead to a deposition of lymph between the cartilages, and this deposition becoming organized and vascular, or even blended with the surface of one of the cartilages, may give rise to the supposition that the free surface of the cartilage itself is the seat of the disease. For this deposition may constitute a real vascular movable membrane in the articular cavity. Hence fungosities and vegetations upon this membrane may be described as those of a synovial membrane. M. Velpeau admits that in the progress of the disease, the cartilage itself may now become implicated, and thus vascularized from its circumference to its central parts. This however, he says, is no proof of a real synovial membrane, as the friends of Bichat maintain, on the diarthrodial cartilages, or that inflammation ever originated on an isolated layer of such cartilages.

The opinion advanced, that articular cartilages are *unorganized*,

is, it must be confessed, contested by a great number of authors. M. Velpeau contends that the *synovial fluid* is directly produced from the surface of the articular cartilage. The salutary organic process of adhesive inflammation, deemed peculiar almost to cellular tissue, and seen as the precursor or protecting interposition intended by nature to circumscribe and to intercept the progress of suppuration, is developed also in close cavities, and with the greater rapidity in proportion as their parietes are smooth and completely serous, finally soldering them together and obliterating the cavity. This adhesive inflammation is dangerous in large cavities, as in the peritoneum and pleura, and may in its turn give rise to suppuration. The *excitation* therefore, where we wish to obliterate a cavity, as in hydrarthrosis, should, as before observed, be so controlled as to produce always an *adhesive inflammation only*, and one which shall never become purulent. The more the effused fluid resembles serum, the more easy is it to procure adhesive inflammation, and the more it resembles pus, the less chance is there of escaping purulent inflammation. Hence it is an important point to change the contained fluid as much as possible into the condition of serum, which our author maintains, can in certain cases be effected by frequently emptying the cavity by puncture. So also with accumulations of blood; and in this manner there is finally poured out instead of blood or pus, a purely serous, or a sero-sanguineous or sero-purulent fluid. This result M. Velpeau has verified in most regions of the body. This brings our author naturally to his favorite injections with iodine, as tested by him with such eminent success in hydrocele, &c., and the latest information in regard to which will be found at length in our notes under that head (*infra*). He remarks in this work under consideration, that additional importance is given to iodine from its well-known resolvent properties, and the beneficial influence which these properties may have upon the *infarcted condition* which is generally found to exist in some parenchymatous organ, in those cases in which there is a serous effusion in a close cavity. This applies directly to an infarcted or congested testicle accompanying hydrocele, and where M. Velpeau has found the true treatment to lie in a course which is the reverse of the old practice. Thus, therefore, instead of endeavoring to resolve the congested testicle before treating the hydrocele, he begins with both, and acts upon both at once by his iodine injections into the hydrocele cavity; that is, provided the infarction is not scirrhus, encephaloid, melanotic, or tubercular, but merely a hypertrophied condition of the testicle. The most fortunate results have been obtained by M. Velpeau by the practice in question.

But it is unnecessary to dilate here on the advantages of these injections, as we have given the latest details from M. Velpeau himself and others, (see this volume, *supra*) and (*infra*), as more fully disclosed in the recent animated discussion to which this subject gave rise in the Paris Academy of Medicine. It is proper, however, to notice the various kinds of diseases of close cavities in which M. Velpeau now successfully employs this treatment:—1. In encysted collections of serum in the tunica vaginalis. 2. Collections of serum in the tunica vaginalis, which communicate with the cavity of the

abdomen, forming what is called congenital hydrocele. 3. Serous collections within a perineal sac, whether the sac be continuous with the peritoneal cavity or otherwise. 4. Encysted serous collections of the spermatic cord. 5. Serous collections in the external genital organs of women, contained in close cavities, and resembling the last mentioned. 6. Serous collections in the lymphatic ganglia of the groin and iliac fossa; and 7. Collections of purely liquid blood in the interior of the pelvis in women. We wish we could subjoin additional successful results to the few well-authenticated cases we have alluded to in our first volume, in which the neck of the sac of several old, large, and reducible inguinal hernias, (not congenital,) has been completely and permanently obliterated, and the hernia radically cured by means of *injections of Tincture of Cloves*, (doubtless suggested by the practice of M. Velpeau,) in the hand of some young and bold practitioner of this country. But we are not aware that this practice has been followed up, though several remarkable cures to which both Dr. Mott and myself were both eye-witnesses, and the happy results of which gave much satisfaction to that surgeon, would certainly authorize new trials with it. M. Velpeau has succeeded with iodine injections in the cavity of a large sanguineous tumor, which was diagnosed and proved to be such by this distinguished surgeon, and which had formed behind the uterus and ascended towards the right iliac fossa. He also succeeded in a case of an accidental close cavity in the thyroid body, which though the first in which he found constitutional febrile reaction caused by the iodine, ultimately recovered. Finally, the same success has attended his iodine injections when thrown into the cavities of the joints, to cure articular effusions, and he had thus already triumphed (when this book was published, 1843) in six cases out of seven of pure hyarthrosis. His experiments on dogs go to show that iodine of more strength than one-seventh of the water used to dilute it, is fatal when thrown into the peritoneal cavity; not however by absorption and poisoning, but by peritonitis and enteritis. The state of this question of iodine injections at the present time will be best understood by our notes elsewhere in this volume, (vid. infra.)

*Treatment of Tumors.*—M. Bonnet of Lyons, with all the natural predilections which an eminent surgeon like him must possess for the chirurgical rather than therapeutical treatment of disease, has in his late important work (*Traité des Maladies des Artic.*, 2 vols. in 8°, Paris, 1845: see a short critique on this work, by M. H. Diday, in the *Gazette Médicale* of Paris, Mai 17, 1845, p. 316 et sequ.) insisted very judiciously as we think upon the absolute necessity of looking to the general diathesis of the whole system as the frequent if not most common source of all fungoid, serous and other growths and diseases in the articulations. Some of his views upon this subject appear to be presented under an original aspect. The cause of these diseases lies, M. Bonnet says, most frequently in an *arrest of organic development*, dependent on the general condition of the system. Thus *articular fungosities* (fungous growths or tumors) for example, are nothing else than plastic lymph which has been suspended by an internal influence; the part which is the seat of the disease being but a type of what is passing in the general economy;



but if the vital energy in the latter, now temporarily paralyzed, should recover itself, these fungosities will be converted into fibrous (i. e. healthy organic) tissue. As in the serous membranes, so in the articulations, the fibrous transformation is the fortunate or salutary maximum or last term of the *nisus formativus*: and wherever a fibrous layer is found upon the articular surface of bones denuded of their cartilage, and that we perceive this tissue expanded into membranes, or concentrated into fibrous bundles (*faisceaux*) going from one articular extremity to the other, we may conclude for a certainty that there has been one step taken towards a cure, a *vis medicatrix* established by nature to complete the evolution of the coagulable lymph.

M. Bonnet makes three distinct classes in the products of secretion which are formed in diseased articulations: 1. Those which are systematically (*régulièrement*) organized; 2. Those which are arrested in their organization; and 3. Those which are not at all organized.

Thus the general diatheses, so clearly established in *arthralgias*, may be characterized themselves by their tendency to favor one or the other of these three products: in the less severe, as in acute or chronic rheumatismal diathesis, the tendency is to the first or effusions of plastic lymph; in other cases, as in the scrofulous diathesis (where synovial fungosities are most frequently met with) a disposition will exist to the secretion of incomplete organic products; in the diathesis which is still more aggravated, [i. e. where there is the greatest degree of degeneration in the organism, T.] as in the tuberculous, purulent and gouty, there are no organic products secreted, but depositions of tubercles, pus and uric acid, [rather lithate of soda either in a fluid state or in crystals, which depositions constitute gout. T.]

*Fungous articular tumors* are unconditionally ascribed by M. Bonnet to the scrofulous or so called strumous diathesis, of which he makes several species, altogether distinct from the products of the tuberculous diathesis, as well by their external appearance as by their peculiar characters.

He makes two distinct classes of scrofulous persons: 1. Those who are pale, thin and without any trace of tumefaction in the external glands; such have also hollow cheeks, the eyelids and lips thin, complexion pallid, and frequently cold abscesses (*abcès froids*) without tubercles. These are individuals with the *purulent diathesis*. 2. The other class have the face full, the alæ of the nose, the lips and the eyelids tumefied, and the glands of the neck in general voluminous. They are disposed to congestions with mucous secretion, ophthalmias, otirrheas, &c. These are what are denominated pre-eminently scrofulous temperaments, but which M. Bonnet proposes to consider as laboring under a *fungous diathesis*, (*diathèse fongueuse*.) In them we frequently meet with local lesions, such as those fleshy soft masses, whose tendency is to suppuration and which are usually designated under the name of *fungosities*, (*fongosités*)—not only in the articulations, but frequently in the bones themselves, under the name of *spina ventosa*; also in the glands, which thence become swollen, and in the nose and cheeks, where they may ulcer-

ate and become the source of phagedenic eruptions (*dartres rongeantes*). [as *phagedena* or *cancra oris*, T.] &c.

M. Bonnet has pointed out with much force, the injury done in the treatment by the common machines employed to keep the joint in a constrained and vicious position, whereby the disease, from a false idea of obtaining repose for the limb, is greatly aggravated, the synovial membrane and ligaments on one side kept in a state of tension, the osseous surfaces compressed on the other, with a permanent tendency to an alteration in the natural relations of the bones. He had by various experiments on the dead body, to determine the best possible position for the articulations, contrived a number of kinds of ingenious apparatus based upon these objects: 1. To bring the limb into such a position that no stress is made on the synovial membrane and ligaments, that no danger is incurred of spontaneous luxation, and that will allow (as in cases of ankylosis) of the easiest exercise to the limb; 2. To retain the part in this position during a greater or less length of time, as may be required to complete the cure.

Among other remedies of a local character, M. Bonnet has derived great advantage in articular diseases from *transcurrent cauterization* with the red hot-iron, frequently repeated, eight or ten times for example, on the same scars—also from the *moxa*, for which purpose he prefers the large *Egyptian* moxa.

*Double Encysted Tumor*.—Dr. W. L. Atlee, of Lancaster (Pennsylvania), gives a very interesting account of the successful removal, by him from a healthy, robust boy aged four years, of an enormous spherical double encysted congenital tumor on the right side of the trunk, which overlaid several of the lower ribs and the abdominal muscles on that side, encroaching even upon the internal abdominal ring. It was closely adherent by a broad base to the tissues mentioned. On making a long incision over it in the direction of the fibres of the external oblique muscle, he finally succeeded by a tedious dissection, rendered the more so by the obliteration of the sub-cutaneous cellular tissue, in extracting the entire mass. This was found to consist of two distinct hemispherical cysts, one within the other, and both filled with serum, the intervening space between the two being filled up by small oval hydatid-like cysts containing pink-colored serum and which communicated with each other by narrow necks. Tough fibro-cellular aponeurotic bands ran over the inner surface of the two principal cavities and connected the whole structure firmly together, giving it the appearance of the interior of the ventricles of the heart. (*Amer. Journ. Med. Sciences*, vol. VII., new series, Philadelphia, 1844, p. 84–88.) T.]

## CHAPTER IX.

## FIBROUS TUMORS.

Among the concrete tumors which remain to be spoken of, I have a word to say of those which are known under the name of fibrous tumors; not that I propose to treat now of *polypis* under this name, (de ce nom,) but of tumors which appear to originate from a concretion of lymph or effused blood in the tissues, or from a transformation or limited hypertrophy in some circumscribed part of the natural tissues. These tumors, which are ordinarily globose, (globuleuses,) though more or less bosselated, are hard, elastic, indolent, and of a grayish color and of a fibrous and mammellated structure. Some excavate for themselves a species of cyst in the tissues, the different layers of which latter they flatten out (étalent) and compress; others are blended so intimately with the surrounding tissues that it is impossible to separate them from these by enucleation. I have seen some tumors of this kind which had acquired the size of the head of an adult, and it is rare they are found of much greater dimensions except in the interior of the pelvis; most usually they do not exceed the volume of a small nut, or that of an egg or the fist. As they occasion no inconvenience in themselves, they may exist during life without any real danger to the patient. As they are, moreover, wholly incurable by any other mode than by extirpation, it is imprudent to meddle with them, unless by their volume, weight or position they occasion some actual trouble or disturbance in the economy, or too great a degree of deformity.

## § I.

To effect their separation by a ligature would not be possible or at least not advisable, but for such as had a sufficiently narrow pedicle or neck at their union with the skin. In regard to this. I have only to refer to what I have said of the ligature for tegumentary tumors, properly so called.

## § II.

When we have decided upon extirpating them, we have scarcely else than to recall the rules for the extirpation of fatty, rather than those for lymphatic tumors. As they are generally disconnected with any kind of constitutional affection, and constitute almost always a disease purely local and separate from and independent of all the natural tissues, and represent, in a word, a simple foreign body in the midst of the organs; a fibrous tumor may be extirpated with every degree of security, and without the necessity of removing with it a large portion of the sound parts. Being rarely liable to return, and leaving a wound which is pliant (souple) at the bottom, and destitute of any dangerous germ, we are enabled after effecting their ablation, to undertake immediate reunion with every possible chance of success. What I have just said, however, is applicable only to those



fibrous tumors which have, so to speak, dug out for themselves a cyst in the midst of the cellular tissue. In fact, in respect to the others, it would be impossible to isolate, and preserve the skin which covers them. There are in fact some which, under this point of view, would lead to unexpected embarrassments if we attempted to operate upon them by the ordinary methods. A porter who had upon his nape a fibrous tumor of the size of the fist, came in 1831 to the hospital of La Pitié to have it removed. This tumor was movable, with a large base, indolent and devoid of any change of color upon the skin. With the view of laying it bare, I made a crucial incision upon it, but soon discovered that there was no limit between its tissue and that of the skin. It consequently became necessary to cut out the four flaps in their whole extent at the expense of its external surface; and when I had extirpated it, I was enabled to ascertain that it was continuous at all its points with the tegumentary tissue, of which it seemed to be nothing more than an inflated (*raréfiée*) layer enormously hypertrophied. The operation was followed by no serious accident; only that the skin in the neighborhood continued hypertrophied after the cure of the wound, so that the patient remained almost as deformed as before the operation. I have since seen two instances of similar tumors, one at the nape and the other at the middle of the back. A third fell under my observation in November, 1838. A man 45 years of age had on the median line, or a little to the right of the anterior half of the cranium, a tumor which at its point descended down to the forehead, and was prolonged upwards to a line with the parietal protuberance. This tumor which had formed gradually and without any appreciable cause, and which appeared to be situated upon an incipient exostosis, had perhaps like the preceding been produced by the repeated frictions to which the diseased region had been subjected, and was moreover movable, without any well-defined limit, and in every respect indolent. In whatever manner it was attempted to displace it, it was always possible to recognize in it a disc or plate of integuments excessively thickened or distended, with an entire absence of degeneration or transformation of tissues. But for fibrous tumors being unaccompanied with this last feature, I should in fact deem those of which I speak a species of flattened elephantine tumors of very limited extent.

It follows from these remarks, that in order to effect a perfect cure, it is necessary to remove at the same time with the tumor every portion of the skin which is adherent to it or constitutes a part of it. In the three last cases therefore I have just mentioned, I refused to operate, inasmuch as extirpation is not in my opinion justifiable, but for those tumors which continue to increase, or which become the source of serious accidents. Some other fibrous tumors, which also include the skin in their composition, are however distinguished from the preceding in these particulars, viz: that well-defined limits soon become established between them and the sound tissues, that the elements of which they are constituted are no longer in a normal state, and that they seem susceptible of dangerous degenerescence and transformation. A man of about 50 years of age, and who came to the hospital of the faculty in 1825, had in his right groin a tumor of this

description, which was of half the size of the head, and extended obliquely from a line with the vessels as far as to the posterior part of the thigh below the scrotum. It was extirpated by M. Roux, and we found that the entire tumor was homogeneous, and formed of a tissue, the section of which presented some analogy to that of Gruyère cheese. The patient got well, but in the following year there returned a similar tumor, which was also extirpated; without however preventing him from succumbing at a later period to the effects of a schirrous tumor which formed on the front part of the pubis. As to fibrous tumors, which are independent of the skin, they may be developed upon almost all the regions of the body and especially in the sub-cutaneous tissue. In a woman operated upon successfully by M. D. Lasserre, (*Cas de Chir.*, etc., p. 17, gg. 1. Perigueux,) he was enabled to extract a fibrous tumor of twice the size of an egg situated upon the upper lip, in such manner from the midst of the tissues as to leave but very little deformity. A patient in whom M. M'Farlane (*Encyclop. des Sc. Méd.*, 1836, p. 56,) had removed a fibro-cartilaginous tumor which was situated upon the side, between the transverse and oblique muscles, died of peritonitis in the course of 31 hours. A young lady on the contrary who had above the crural arch, a fibrous, movable tumor, of the size of a small egg, recovered perfectly from the operation which I had recommended to her, and M. Yvan junior has communicated to me a similar fact. A patient who had one of the size of a large nut on the dorsum of the metatarsus, came to have it extirpated, at the hospital of La Charité in 1836. Having divided the integuments by a simple incision, I seized the tumor with an erigne and proceeded immediately to its removal. The consequences of the operation were simple, and the tumor did not reappear. Another patient operated upon in 1837 at the same hospital, for a tumor in every respect similar, and which was situated two inches above the external malleolus, between the tendo achillis and the fibula, was cured in the same way. I have removed from the breech of an adult man a fibrous tumor as large as an egg, which did not go deeper than the aponeurosis and was never reproduced. Another patient whom I operated upon in 1835, had one of the same nature between the anus and tuberosity of the ischium. The cure of this also was radical. But a woman who had one of these tumors on the dorsum of the point of the sacrum, and which adhered throughout its deep-seated surface to the periosteum, thus rendering its dissection sufficiently delicate, was seized with an ichorous suppuration, caries of the pelvis and general accidents, which caused her death at the expiration of a month. Tumors of this description which I have met with in the breast or the head, will be referred to again in other articles. I will merely add that whatever be their situation, if the skin which covers them shall be found too much attenuated or actually degenerated, it will be advisable to remove an ellipse from it or take it away entire at the same time as the tumor, rather than attempt to dissect it. A young girl of eleven years of age had on the radial and dorsal side of the root of the middle finger, a hard, bosselated, blackish-looking tumor of the size of a large nut. With this tumor, which I isolated from the hand while respecting the metacarpo-phalangeal

articulations and neighboring extensor tendons, I removed also a flap of integuments one inch in length and six lines in width. A strong and robust man had, from the age of 20 years, above the outer malleolus, a globular and very movable tumor covered with attenuated reddish-colored integuments. Having seized this tumor with an erigne, I circumscribed it in an ellipse of the skin, and removed the whole of it while dissecting its deep-seated surface. By this mode, the operation is prompt and certain, and ought to have the preference when it does not cause too great a loss of substance. With these exceptions, fibrous tumors must be submitted in every respect to the rules of treatment indicated for lipomatous tumors.

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## CHAPTER X.

### CANCEROUS TUMORS.

All the tumors of which I have hitherto spoken, come within the class of tumors denominated *benignant* by the English surgeons. Those on the contrary designated under the title of cancerous tumors, have a character of *malignity* which has always served to distinguish them from the others. Their tendency to repullulate and to multiply without end, has ever constituted them the opprobrium of surgeons. If they are attacked on one side, they soon reappear on the other. Frequently the most simple operation will be sufficient to irritate (exaspérer) them and aggravate all their symptoms; no method of treatment, even at their first appearance, can promise any certainty of effecting their radical cure. There are a great many surgeons moreover, who advise that we should do nothing with them, or make use only of palliative means. Nevertheless, upon the supposition that these tumors are primarily a local affection, and admitting also their malignant character, I lay it down as a principle to destroy them as soon and as effectually as possible. To me it appears evident, that if there is even room to hope for their cure, it must be by means of their mechanical or chemical destruction, and by attacking them before they have had time to introduce new morbid germs into the rest of the system. All the varieties of tumors however, denominated cancerous, do not exhibit the same tendency to repullulate. Those which in this respect should be placed at the head are the *melanotic* (mélaniques) tumors; then come the *encephaloid* tumors; *scirrhus* tumors would be placed in the third line, and the *colloid* at the bottom of the scale. These particularities, which I will discuss more at length while speaking of the extirpation of the breast, convey an idea of the course which the surgeon ought to pursue in regard to the prognosis and treatment of cancerous tumors in general.

#### § I.

Should the tumors be purely melanotic, composed of flocculi or clots of anthracine, we should avoid performing the slightest operation



upon them, provided there existed at the same time with the principal nucleus some spots or granulations of the same nature, either in the neighborhood or in other regions, even though the patient should in other respects appear to be in excellent general health. A man in other respects in good health, came in 1834 to the hospital of La Pitié for the removal of a melanotic tumor upon the temple, of the size of a large nut. This tumor, which M. Olivier of Angers had extirpated a year before, and which had scarcely then the size of a small nut, had reappeared only since the last three months. All the internal organs performed their functions freely. No other tumor existed upon the surface of the body, and the patient, who considered himself in other respects in perfect health, retained also all his natural embonpoint. I extirpated the tumor; the operation presented no difficulty, and everything went on well for about twelve days. The wound then became sanious, general symptoms made their appearance, and death took place six days after. The opening of the dead body disclosed the fact that innumerable melanotic tumors existed in the interior. The liver especially was riddled with them; they were found here in hundreds, some having the size of an ordinary pin's head, others equalling that of a small egg, and all presenting precisely the appearance of truffles, either in their crude state or reduced to pulp. A patient who for twenty years had had a melanotic tumor (grumeau) on the dorsum of the foot, without ever having experienced the slightest symptoms of general disease, desired in the month of October, 1838, to have it removed. The tumor, which was only of the size of a small nut, was readily extirpated. Seeing that the suture of the wound threatened to cause a phlegmonous erysipelas, I returned to the simple dressing and union by the second intention. Up to the present time there is no appearance of a return of the disease. But will this cure remain permanent? A woman who had undergone amputation of the great toe for a similar tumor, was not yet cured of her wound when the ganglions of the groin and iliac fossa had already become attacked to such an extent that in less than a month she had in those regions enormous black masses, which soon caused her death. However slight therefore may be the grounds for believing that there shall exist any remote engorgement or internal derangement, the surgeon should rank melanotic tumors in the category of the *noli me tangere*.

## § II.

In the case of *cerebroidal* (cérébroïdes) tumors, we must proceed nearly in the same way. Nevertheless, if the disease exists in a subject who is still young and in other respects in good health, and if the lymphatic ganglions situated above remain wholly unaffected, and the tumor is of recent date and perfectly well defined, the chances of cure are assuredly greater and more numerous than in the case of melanotic tumors.

## § III.

In a *scirrhus* tumor there is less tendency of reproduction in the midst of remote organs; but more frequently than the two varieties of which we have been speaking, it reappears upon the place only or

in the neighborhood of the part which the first tumor occupied. It is because this class of tumors present themselves under the form of a degenerescence or transformation of the natural tissues, as well as under that of abnormal productions and simple foreign bodies. It results from this that a scirrhus is usually badly defined, and that it often sends out to the circumference radiations or roots whose terminations cannot be traced without difficulty. Moreover, it is advisable when we have decided upon operating, to remove at the same time a sufficiently large proportion of sound parts, and we should abandon the attempt to relieve the patient, if there existed in the neighborhood of the tumor, either beneath the skin or even in the substance of the integuments, the slightest indurated plate (plaque) or smallest lardaceous radicle that could not be extirpated. In cases of melanosis and encephaloid matter, our attention is to be directed towards the condition of the remote organs; while in cases of scirrhus on the contrary, it is the vicinity of the tumor which is to be specially examined.

#### § IV.

*Colloid* tumors, which besides being sufficiently rare, often attack the bones, have this peculiarity, that they usually remain local, and well defined like cerebroidal tumors, at the same time that they seem to be concentrated on the organ which was their primary seat. It is these, consequently, in which the operation presents the most chances for success.

#### § V.

The operations proposed for cancerous tumors are the same as those for the tumors designated in the preceding articles. It is not my intention at this moment to speak either of internal remedies, or of the topical applications purely discutient or resolvent that have been so much lauded by some persons; experience having proved that such means are totally inefficient when legitimate cancerous tumors are under treatment. I would say the same of compression, if it had not found among us new advocates. For myself, I do not believe that compression has ever radically cured or dispersed tumors belonging to either of the four kinds which I have just been treating of. If it should be contended that it at least has the advantage of lessening or extinguishing the engorgement, and thickening of the neighboring tissues, (*l'empâtement du voisinage*), and of thus rendering the other operations more easy, I would reply, that this is a specious argument which cannot sustain a close examination. In fact, cancerous tumors are not generally accompanied but with a very slight engorgement of the surrounding parts; moreover, to have any real hope of success, it is important to remove with the tumor a sufficiently large portion of sound tissue. But what would compression do in a case of this kind? Suppose it should have shrunk the tumor and diminished its volume; the instrument might be carried nearer to its confines, but we should to the same extent increase the chances of a return. Unless, therefore, inflammation or chronic engorgement of the cellular tissue should have been established around the principal disease, compression must be rejected from the *curative* treatment of cancerous affections.

A. *Cauterization*.—The destruction of cancers by means of the hot iron or chemical caustics has been eulogized at every epoch. In spite, however, of the successes obtained by means of their powders or pastes, they had been generally renounced by Rousselot, and Frère Cosme, when their efficacy has been again announced by practitioners in Germany, England and France. Arsenical caustics and nitrate acid of mercury, besides being hardly applicable except to superficial cancerous plates, have, moreover, the inconvenience of being partially susceptible of absorption, and of thus exposing to actual poisoning. The zinc paste, introduced into practice by M. Canquoin, having the property of mortifying the tissues in the manner of a punch, to such depth as is desirable, would always deserve the preference if it would adapt itself to the anfractuosités and inequalities of certain tumors, or did not exact the previous destruction of the epidermis. Whenever this paste cannot be applied with facility we may make use of the Vienna caustic or paste, which has the advantage of being introduced in the manner of a pulp into every possible chink, and of moreover cauterizing with great energy; (see Vol. I.) Potash so called, butter of antimony and the concentrated acids are, therefore, excluded from the catalogue, in consequence of their tendency of fusion into the sound tissues, and their uncertainty. But caustics, of whatever description they may be, ought they to have the preference over the operation, when the question under consideration is cancerous tumors? On this point it is necessary that we should understand ourselves; if the skin is sound and the tumor movable, and can be cut out by a bistoury so as to leave a wound whose lips may be more or less perfectly approximated, caustics will not be admissible except in those patients who absolutely refuse extirpation. If the tumor has more width than thickness, includes the integuments, is ulcerated upon its surface, is situated at the bottom of an ancient wound, and prolonged into some cavity to a great depth, and soldered (*plaquée*) as it were against the bones; if, in a word, it is not possible to remove the cancer without causing a loss of substance equal to the integuments, then caustics, and the zinc paste, especially that of Vienna, may be made trial of, and would in some cases even deserve, I think, the preference.

B. As to the *cutting instrument* and the ligature, they should be employed here according to the rules which I have pointed out under other tumors, especially for fungous sanguineous tumors. I shall, however, return to this subject in detail in treating of tumors of the breast. This last remark renders it unnecessary for me to treat of cancerous tumors according to the regions or organs they attack. I will only add that for a tumor of the foot, which extended to the bones of the tarsus, I deemed it proper to amputate the leg; that in a case of cerebroid tumor of the calf, I amputated the leg at the knee; that an enormous mass of the same nature which occupied the leg of a young sailor, induced me to give the preference to amputation of the thigh; that for a scirrhus tumor of the metacarpus, I amputated the wrist; that for a colloid mass upon the radius, I amputated the fore-arm; that analogous tumors have induced MM. Luke, Janson, Roux, Castara and others, to amputate the shoulder; that I have disarticulated the arm for a disease of the same kind; and that as a general rule



we ought to prefer amputation of the limb to extirpation of the tumor, whenever the disease penetrates to the neighborhood of the bones, so as to implicate a portion of the muscles, nerves, and large vessels. Underneath the skin, on the contrary, and in the substance of the tegumentary tissue, it is advisable to treat cancers by simple extirpation, or by caustics. A woman who had a cerebroid plate as large as the hand between the umbilicus and the epigastrium, was cured by means of two applications of the zinc paste. Another woman, who had upon the thorax, below the left shoulder, an analogous plate which was hard and without ulceration, was relieved by the following process: having raised it up a little, I glided the knife under it flatwise, and immediately detached its lower half, completing its isolation with a second cut by returning the edge of the knife from above. The wound, which did well during fifteen days, having taken on a sanious aspect, and become covered with inequalities of a bad appearance, the idea suggested itself of covering it with a layer of zinc paste. After the fall of the eschar, the wound went on rapidly to cicatrization. I have met with and destroyed plates and tumors of the same description upon the leg, thigh, around the knee, at the breech, upon the side, in front of the chest, on the side of the neck, and upon the cranium and face in an infinity of cases, but without the operative process having exacted any thing special that requires to be related here. It will also be under the head of cancerous tumors of the breast, that I shall have an opportunity of discussing the advantages and inconveniences of immediate or secondary reunion, and the different kinds of anaplasty that may be employed after the removal of cancers in general.

#### [CANCEROUS TUMORS.]

In thirty cases of *cancerous tumors of the breast* treated by M. Tanchou, (see *Journ. des Connaiss.*, &c., de Paris, Dec., 1842, p. 253,) he has obtained, he asserts, ameliorating results, and more or less complete dispersion of the tumors, by means of *graduated and methodical compression*, by compressors specially adapted to this purpose, and also by external applications of sachels containing iodate of potash, pulverized sponge, (eponge en poudre—meaning, probably, burnt sponge, a remedy of 2000 years' standing in bronchocele,) chlorhydrate of ammonia, and chlorhydrate of soda; also other compounds made with the powder of sponge, nitrate of potash, and Florentine iris. He proscribes all surgical operations.

M. Martinet de la Creuse has ingeniously proposed, and several times succeeded, (see Malgaigne's *Manuel de Méd. Operat.*, 4th edition, Paris, 1843, p. 118,) in making for the wound, after extirpating scirrhus and carcinomatous tumors, a healthy flap of sound skin borrowed by the anaplastic method from the neighborhood.

M. Ollivier, who has otherwise written so well on these tumors, proposes the daring expedient (op. cit.) of inoculating their centre with hospital gangrene!

From statistical observations obtained by M. Leroy d'Etiolles, from every department of France, (see the result of these researches communicated by him to the Academy of Sciences of Paris, February

20, 1843, in the *Journ. des Connaiss., &c.*, of Paris, Mai, 1843, pp. 214, 215,) on the subject of *Cancerous Diathesis and Degeneration*, we learn the fact that out of *two thousand seven hundred and eighty* cases, communicated from 174 practitioners in those departments, there were 1192 who were not operated upon, or who died with the disease upon them. Of these, 18 lived more than 30 years after the development of the disease, which, after reaching a certain point, remained stationary and indolent. But out of 801 operated upon, either by the knife or caustics, *four* only lived to the same length of time. Of those who lived from 20 to 30 years, we find 34 who were not operated upon, and 14 in whom an operation was performed. Of those who lived from 6 to 20 years, there were 88 who were operated upon, and 228 in whom the tumor was not extirpated. So that the balance in cancerous tumors, so far as the prolongation of life is concerned, is clearly not in favor of the operation.

So far as regards a short term of existence, the difference appears to be in favor of the operation; thus counting from the first appearance of the disease, the average prolongation of life in those not operated upon is, for men, five years, and for women, five years and six months; while in those operated upon, the average, for men, is five years and two months, and for women, six years. And in these cases, we find the average of time that expired before the operation was, three years and nine months for men, and the time after the operation, one year and five months only; while for women it is three years and six months before, and two years and six months after the operation.

To those who say that the return of the disease is too often owing to the operation for extirpation having been procrastinated, by which time was allowed for degeneration to be established, M. Leroy d'Etiolles replies, that among the numbers in this table in whom the disease was reproduced, 61 had the tumor extirpated in less than a year after the disease made its first appearance; and that 30 patients who were operated upon five years after its first development, did not have a return of the disease, and that the same result occurred in 22 others who were not operated upon until more than ten years after the first appearance of the disease.

In conclusion, M. Leroy remarks, that though it may be impossible to determine beforehand, whether a tumor will remain stationary or become cancerous, it is worthy of investigation to ascertain if the *cancerous diathesis* does not produce in the subjects in whom it exists, certain characters (as for example, a change in the condition of the fluids of the economy,) by which it may be recognized.

*Fibrous Tumors (corps fibreux) in general—Fibrous Tumors of the Breast (corps fibreux de la mamelle.)*

The justly distinguished M. Cruveilhier, in a memoir read before the Paris Academy of Medicine, on *Fibrous bodies of the Breast*, (des corps fibreux de la mamelle,) (read Jan. 9, 1844—see this memoir in the *Journal des Connaissances Medico-Chirurg.*, Paris, March 1, 1844, p. 8 to p. 93,) conceives that they have not been sufficiently studied, that they are a very frequent disease, (lesion,) and that they are constantly confounded in practice with scirrhus and indurated

cancer of these organs, and as such, subjected to extirpation. He believes that such tumors are incapable of degeneration, that they never require extirpation, that they are in some sort functional, (facultative,) that when extirpated they are never reproduced, (ne répullulent jamais,) in the proper sense of this word, but are a purely local lesion and organic production, independent of every kind of general infection of the economy, whether as a cause or effect.

Neither Boyer nor Sir Astley Cooper have mentioned this disease, nor is it more than obscurely alluded to by more modern writers.

*Fibrous Bodies in general.*—Such growths were for the first time described by Bayle as found existing in the uterus. Like Bichat, however, who considered that each tissue had its own lesions, he erroneously thought these bodies were confined to the uterus. True, the conditions in this organ are most favorable to their production and development, but they are met with in all organs where fibrous tissue is found, and are composed of two orders: 1st. As *vegetating fibrous bodies*, growing from, or implanted in, (implantés,) a membranous surface in the manner of a vegetable, like fibrous polypi of the nasal fossæ, formed at the expense of the periosteum; fibrous tumors of the dura mater; and fibrous, cartilaginous and osseous tumors, which grow from the periosteum of the bones and which may be called *osteo-chondophyte*. 2d. As *non-vegetating fibrous bodies*, (les corps fibreux non-implantés,) which grow in the interior of the organs, (au milieu des organes,) such as the fibrous bodies of the uterus, those of the breasts, ovaria and testicles.

Their *general characters*, according to the author, (M. Cruveilhier,) are: 1st. That of *situation*, always in the midst of the fibrous tissues. 2d. That of *form and size*. Their form is generally spheroidal, sometimes irregular upon the surface, sometimes mammellated, at other times deeply furrowed, (sillonnée,) giving rise then to the lobular arrangement. Their size varies from a cherry-stone, or even a millet-seed, to that of the head of an adult, or even greater, their weight being sometimes equal to 45 demi-kilogrammes. 3d. *The characters deduced from the mode of adhesion and connection of the fibrous bodies, with the tissues, in the midst of which they are developed*. Vegetal fibrous bodies (above) seem to be mere prolongations of the tissue of the organ, but all other fibrous tumors are united to the parts in which they are developed, only by means of an exceedingly loose cellular tissue, so that these bodies may be enucleated with the greatest ease by means of the finger, a blunt probe or slight traction, *without ever requiring the aid of a cutting instrument*. In this respect these bodies are, in their isolation or independence of organization, similar to *encysted tumors*, with which also they are sometimes confounded. 4th. *In their characters of texture*, fibrous bodies or tumors are of an extreme density, similar to cartilage, or to the unimpregnated uterus proper. If the fibro-cartilaginous tissues of Bichat could be sustained, fibrous bodies would come under them. These bodies are, in fact, composed of parts arranged *linearly* and belonging to the albugineous tissue, strongly pressed against each other, interlaced together in every possible direction, and often divided into many groups of fibres, and pelotoned (pelotonnées) in such manner as to constitute distinct masses or lobules. They are provided with veins whose



trunks are on the surface, and their minute branches distributed to their substance. When these tumors are lobulated, veins of greater or less size are found in the intervals of the lobes. These veins communicate directly with the proper tissue of the organ in which the tumors are. No *arterial vessel* can be traced into these tumors—injections from the neighboring arteries will not penetrate them, and no lymphatic vessel or nerve has yet been shown to exist in them. They therefore possess no other organic element than a fibrous tissue, supported (animé) by veins, and are reduced down to an obscure nutrition sustained by a feeble oscillatory movement of venous blood.

5th. *The evolution of fibrous bodies* presents the same characters at their first appearance as at their complete development, whether the tumor be only of the size of a cherry-pit, or has attained that of the fist (poing) or head. Facts have satisfactorily established, in the mind of M. Cruveilhier, the conclusion that if some of these bodies are primarily fibrous, and afterwards become cartilaginous or osseous, a number of them will present one or other of these last mentioned characters from the beginning.

6th. *The consecutive pathological characters* of fibrous bodies are: *a.* The consecutive results produced by fibrous bodies on the surrounding tissues, which consist only in the inconvenience occasioned by their weight, being in truth nothing more than parasitical foreign innocuous growths, having a peculiarly limited vitality, which causes no other change in the tissue in the midst of which they are developed than some indispensable modification of nutrition and circulation; *b.* The consecutive changes which are effected in the fibrous bodies themselves, and which are exceedingly limited. These bodies may indefinitely increase, or they may remain stationary. Many facts authorize M. Cruveilhier to believe that they are susceptible of an actual diminution of volume, or a sort of atrophy, or may become encrusted or penetrated with phosphate of lime, or the seat of an œdema, which dissolves the elements that enter into their composition and makes manifest their lobular arrangement. In this case, the tumor is often impregnated with a liquid which possesses, in appearance at least, much analogy to that of synovia.

*Fibrous bodies are incapable of cancerous degeneration.* “I believe also,” says M. Cruveilhier, “that I am sustained in saying (and this character is of the highest importance) that *there is an incompatibility between fibrous production and cancerous degeneration.*”

To ascertain if these general characters apply to certain organic productions observed in the mammæ, he invokes a great number of clinical facts, and some from pathological anatomy. Of all other secreting organs in the animal economy, the mammary gland, says M. Cruveilhier, presents the *greatest quantity of fibrous tissue*, and has besides adipose tissue, two essential elements that enter into its texture; viz., 1. A fibrous woof (charpente) or gangue; 2. Glandular granulations or grains, which latter cannot be well examined, except in women who have died during pregnancy, and especially after parturition, during any period of lactation; that except under these circumstances, mammary granulations are but very little developed, which feeble development is then in correspondence with the almost complete absence of secretion in this organ; that after the cessation of the menses, and especially in very old women, the granulations

seem to disappear entirely, leaving the fibrous woof only remaining. The mamma, therefore, possesses in a high degree, the conditions favorable to the development of fibrous bodies.

In the mamma, the fibrous bodies or tumors appear as small spheroidal tumors, from the size of a millet-seed or cherry-pit to a pullet's egg, or larger. Their surface is sometimes uniform, or mammellated (*mamelonnée*), and their hardness is extreme, or as it were, stony (*pierreuse*). Generally sub-cutaneous, they may also be developed in the midst of the tissues of this organ; and are for the most part circumscribed, perfectly distinct from the tissue of the mammary gland, adhering to it only by a very loose tissue, apparently perfectly independent of this gland; they possess the mobility of a lymphatic ganglion, (i. e. gland,) and like that roll under the finger, from whence doubtless the name of *glands*, given to them in common parlance.

Thus are these characters precisely those that M. Cruveilhier has given of fibrous bodies in general.

The absence, hitherto, of all clinical and anatomical descriptions of fibrous bodies has caused them to be constantly confounded with other lesions of the breast, and especially with scirrhus degenerations of that organ—giving rise to the same rules of treatment, and the same prognosis as applicable to both. In respect both to fibrous bodies and to scirrhus degenerations, it has been asserted that such fibrous tumors of the breast as are commonly called glands, may exist for a long time without undergoing any perceptible growth, but that after 40, 45 and 50 years of age, they increase with great rapidity, and invading the surrounding parts, vitiate the whole animal economy, and present all the characters of an incurable cancer. Hence, as the consequence of such ideas, was that of the necessity of immediate extirpation—and that the sooner, therefore, this was done after these tumors appeared, the less the danger. This was the sole mode of treatment; not that practitioners asserted that such degeneration must always ensue, but being ignorant of any diagnostic marks between cancerous tumors and those incapable of such degeneration, “they preferred ten unnecessary extirpations to the omission of one that was absolutely essential.”

Even so little has been known of the pathological anatomy of mammary lesions, that encysted tumors themselves and œdematous indurations of these organs, are usually confounded with cancerous tumors, and often submitted like the last, to the general law of extirpation. “Such also, (says M. Cruveilhier, with great candor, while advocating, distinguished anatomist and surgeon as he is, humane doctrines so honorable to him, and so plainly deducible from the important truths he discloses to the profession,) was my rule of conduct fifteen years since. I postponed the advice to extirpate only to obtain time to prepare the patient for this operation, finding him always tranquil and resigned, when the terrible word *cancer* was pronounced.” Doubts, however, even then arose in M. Cruveilhier's mind, and especially from seeing in young girls, scarcely arrived at puberty, and in young women in rosy health, numerous cases of movable, rolling, circumscribed, indolent, and isolated tumors; and also from seeing a number of these tumors in the same breast, or simultaneously in both breasts. He asked himself the question if

such little tumors, whose discovery was so often due to chance, ought in reality to be considered a cancer in its first stage. This suggestion was strengthened by finding that many women who had refused to be operated upon, or in whom he had deferred it, went on for a great number of years under his observation, without any perceptible increase of size or degeneration in such tumors, though many such women had become pregnant, and suckled their children, and many of them had passed their critical period of life.

The fact of non-reproduction (*défaut de répullulation*) after extirpating tumors of this kind, may also be adduced as a clinical proof of the innocence of these tumors, and their totally foreign character to that of cancerous degeneration; for it is well known how common it is for true mammary cancers to grow again after their removal.

Proofs deduced from pathological anatomy, in favor of these positions, were soon obtained by M. Cruveilhier. An examination of a great number of mammary tumors extirpated for scirrhus or incipient cancer (*à l'état de crudité*) convinced him that several of them exhibited the same character of form, density, and texture, as the fibrous bodies of the uterus, and offered in no respect any of those of cancer. One important fact was established by this eminent anatomist, viz: that a number of fibrous mammary tumors, which, on examination, appeared at first to be full (*pleines*, i. e. round, uniform and smooth) were found, to be arranged after the manner of geodes (*géodes*). That is, on dividing them in two equal halves, each half could be turned inside out, upon itself, so as to form a hemispherical cavity, whose internal surface was then formed by the external surface of the tumor, and whose external surface was formed by the surface of the incision. But this now external surface was thick set (*herissée*) with globular vegetations or fibrous granulations, some of them isolated, and others that were branched after the manner of a polypus; these fibrous vegetations or globules, which were superposed on each other (*qui se modelaient les unes sur les autres*) being sometimes free, and at other times adherent to each other by means of small prolongations. These adjoining (*juxtaposés*) fibrous vegetations, knots or swellings, in the cases described, constituted a cavity without walls. In some cases, there was found in the centre of these fibrous bodies, a cavity filled by a viscous fluid, analogous in appearance to synovia.

M. Cruveilhier has had occasion to see many œdematous fibrous bodies of the breast, which had rapidly acquired a great size and were speedily extirpated, and which bodies corresponded exactly with the fibrous bodies of the uterus, their mass being penetrated by a viscous humor, similar to synovia, and their centre here and there occupied by numerous geodes, without membrane or cyst, and filled with a liquid matter. In conclusion, M. Cruveilhier remarks that he considers himself upon the strength of such facts, obtained from clinical observation and pathological anatomy, justified in adopting these propositions:—1. The mammary gland is subject to the development of an organic production known under the name of *fibrous bodies*. 2. That the fibrous bodies (or tumors) of the mamma, which constitute one of the most frequent lesions to which this organ is liable may be distinguished by certain signs from that kind of induration, which succeeds to chronic inflammation, and also from can-



cerous tumors; the tumor neither in chronic inflammation, nor in cancer, being in any manner distinct from the mammary gland itself, at the expense of which it is formed, and with which it is continuous without any line of demarcation; while the fibrous bodies are completely detached from the mammary gland and roll under the finger in the manner of a cyst or lymphatic gland (ganglion). 3. That as these fibrous bodies are incapable of cancerous degeneration, extirpation is not necessary, upon the supposition (*en tant que*) that these bodies may endanger the life of the patient, by the ulterior changes which may take place in their interior. Fibrous bodies constitute a lesion which is essentially local; their extirpation is, so to speak, contingent (*facultative*), and would not be requisite unless from the inconvenience caused by their weight and size. After fibrous bodies are extirpated, they never grow again, (*répullulent*) in the proper sense of this word; though new fibrous bodies may be developed in a breast which has been the seat of a previous extirpation.

At the sitting of the Paris Academy of Medicine, (January 16, 1844,) following that at which M. Cruveilhier read his memoir, an animated discussion arose among the members upon the merits of the new doctrines therein advanced. As this discussion (see *Journ. des Connaissances*, &c., Paris, March 1, 1844, p. 124, &c.) was one of a practical bearing, maintained energetically through a number of sittings of the learned body alluded to, it will not be improper briefly to notice the leading points and views of some of the most eminent surgeons of Paris, (especially as our author, M. Velpeau's own views are also given in the debate,) to show what conclusions also their experience in the rapid progress of surgery, has led them to form, up to the present epoch of the history of our art.

M. Blandin considered *fibrous* tumors of the breast rare as compared with the ordinary tumors of that organ, and especially with its encysted tumors. He also believed fibrous tumors capable of degenerating, that it was impossible to distinguish them from cancer, and that there was no danger in extirpating them. M. Rochoux had found by the microscope scirrhus matters scattered through the interstices of these fibrous tumors. M. Gerdy did not always consider their diagnosis easy: as an example he mentioned fibro-cartilaginous lobular tumors, making a crepitus under the scalpel, &c., and having the same characters as M. Cruveilhier's tumors, and also as Sir Astley Cooper's *irritable tumors* of the breast. Though fibrous tumors may possess analogies to fibrous tissue, they differ from it. He has found three sorts of tumors: benign, malignant, and the doubtful, which may degenerate. The second exhibit a *depression* of the skin at the centre, when the tumor is compressed between the hands, and are marked by peculiar lancinating pains.

M. Velpeau admitted that there were, in fact, mammary tumors which did not degenerate, but he did not consider them in reality the same as the *fibrous* tumors of M. Cruveilhier, which latter are susceptible of this change. M. Velpeau considers this peculiarity to belong to tumors which he denominates *fibrinous* (*fibrineuses*), caused by the extravasation of the fibrine of the blood after a blow or a contusion. M. Cruveilhier, as M. Velpeau thinks, has included such tumors under his fibrous order. The microscopic characters of fibri-

nous tumors have, according to M. Velpeau, been satisfactorily ascertained by M. Mandl; in fibrinous tumors, the microscope discloses nothing but fibres and fibrilli. But the characters during life are not always recognizable, and it is rare that we meet with such tumors except in young people; in other words, we meet them more frequently in that class of persons. M. Velpeau does not believe fibrinous tumors of the breast capable of degenerating, any more than those of the uterus, at least such a result must be rare. He blamed M. Cruveilhier for not having entered more into the subject of the treatment, and for confining himself to proscribing the operation without pointing out some other therapeutic means. For his own part, considering that both fibrous and even indolent tumors, rarely present characters of a very satisfactory nature, and that they are a source of perpetual disquietude to the patients, he is of opinion that they should always be removed (*les operer*), this method having at least the advantage of giving confidence to the patient as well as physician, (*loc. cit. p. 125.*)

M. Cruveilhier expressed himself gratified with the remark of M. Velpeau, that fibrous or fibrinous tumors were not susceptible of degeneration; with which opinion also M. Moreau coincided. M. Roux (*loc. cit., p. 125*) thought the consequences would be disastrous if the principles of M. Cruveilhier were admitted. He apprehended the latter had taken for his type of fibrous tumors of the breast those that are called fibrous bodies (*i. e.*, tumors or growths) of the uterus, two things essentially different. He denied also that one of their characters was that of being encysted, as encysted tumors must enclose a liquid, and such tumors are rarely fibrous. He admitted that many tumors did not degenerate; a prognosis to this effect was a subject of immense difficulty, and could only be made of young persons. He himself confessed, (and where was the surgeon who had not) that he had extirpated tumors as cancerous which were not so. He would not pretend to declare that fibrous tumors never degenerated, but thought they did not do so spontaneously, but might become degenerate (*i. e.*, cancerous or malignant) under certain circumstances. He opposed as dangerous, the principle (*loc. cit., p. 126*) of M. Cruveilhier, that the operation should be conditional (*facultative*;) M. Roux thinks it better to operate even under this point of view. He notes the omission of M. Cruveilhier to give the characters of benign tumors: M. Roux says, in fact, there are none such; they may however, in rare cases, be absorbed by some spontaneous process or by means of local resolvents. The operation is rarely fatal, and its moral effect alone is a matter of great importance, seeing that the tumors do not return. M. Cruveilhier, in rebutting the ideas of M. Roux, also remarked that what were called *strumous* tumors of the breast were also confounded with the fibrous; but that such *strumous* tumors were *neuromas* and not *scrofulous*. He went so far as to say that the existence of fibrous tumors in the uterus was an *immunity against cancer in that organ*. M. Amussat denied the frequency of fibrous tumors of the breast; thus the Dypuytren museum, so rich in fibrous tumors of the uterus, is exceedingly deficient in those of the breast. He believed they would degenerate, and was in favor of operating always for such tumors, and even for a simple

lipoma (loupes). M. Bérard also took ground against the opinions of M. Cruveilhier. M. Lisfranc considered fibrous tumors of the breast exceedingly rare, as he had ascertained from having extracted an immense number of tumors of the breast. Yet such as M. Cruveilhier describes were not uncommon. He does not think them exempt from degeneration: and expressed himself diametrically hostile to the doctrines of M. Cruveilhier.

M. Castel (loc. cit., p. 164) called attention to the opinion of Bichat that the glandular tissue is as widely different as possible from the fibrous tissue. M. Cruveilhier remarked that the chief difference between him and his colleagues arose from their attaching a different meaning from him to the phrase *corps fibreux*. M. Blandin thought (loc. cit., p. 168) the therapeutic part of this question was overlooked, and stated that he considered it impossible to diagnose such tumors. He thought the idea too dominant on M. Cruveilhier's mind, that cancer was also constitutional and must return after an operation. M. Blandin maintained also, that a cancerous condition and fibrous tumors were not incompatible. These fibrous tumors of the breast are so rare that some practitioners, who have frequently removed tumors from the breast, declare they have never met with them, as MM. Laugier and Blandin. M. Blandin explained the non-degeneration of fibrous tumors of the uterus at Salpêtrière, because they were usually old women whose constitutions were dried up—not young, in whom the natural moisture and fluids of the parts favored such degeneration. He avers that fibrous tumors of the breast may become the germs of cancer; for, as M. Andral says, why should not the abnormal fibrous tissue degenerate into cancer when it is admitted that the normal does. M. Blandin alluded to the tumor removed by him from the vault of the palate and shown to the Academy, and admitted by M. Cruveilhier to be cancerous—proved so in fact, and to be both fibrous and cancerous by M. Mandl, who saw in it the cancerous globules scattered upon a groundwork (canévas) of pelotones of fibres—which proof of degeneration of fibrous tumors into cancer, is to be added to a similar one of Dupuytren in respect to those of the fibrous polypi of the nose. M. Blandin cited two other cases where this cancerous degeneration became even encephaloidal, and yet its removal was not followed by a return of the disease. If it be admitted, says he, that we cannot make a certain diagnosis of fibrous tumors of the breast, and at the same time that we deny the possibility of their degeneration, then ought we also to operate upon all indurated tumors which are not resolvable.

M. Cruveilhier maintained (loc. cit., p. 169) that the tumor from the vault of the palate mentioned by M. Blandin, was not a fibrous body become cancerous, but an instance of *fibrous cancer*, a very different thing. The various abnormal productions always preserve their peculiar characters; they do not undergo transformation, since cancer remains cancer, and tubercle continues tubercle, in the same way as fibrous bodies continue to remain fibrous. He acknowledges that *encysted cancers* are never reproduced, but unlike M. Blandin, he deems them exceedingly rare.

M. Gerdy (loc. cit. p. 212,) thought a difficulty arose in this discussion from each one dwelling upon the peculiar characters of



tumors separately, instead of viewing them in their *ensemble*, when we should discover a certain class of tumors, which may be distinguished both from scirrhus and from degenerate tumors. Thus, in considering these characters as a whole, when we find the simultaneous existence in the two breasts, or in one alone, of numerous small tumors, which are hard, elastic, indolent, rolling and clearly isolated, and the absence of cutaneous folds or depressions when the breast is pressed between the fingers, as is so accurately described by Sir Astley Cooper, we can no longer doubt that such are *fibrous tumors*. Difficult as the diagnosis sometimes is, there is this thing certain, that we should not operate when the tumors are clearly benign; in the opposite case, or if we are in doubt, we should operate. M. Dupuy considered that the only difference between scirrhus tumors that degenerated and those that did not, lay in hereditary predisposition. M. Lisfranc thought the less frequency of uterine cancer, dated from the discovery of the operation, which disclosed those ulcerations that are the most frequent source of it, and by which we are enabled to apply a radical cure in season. M. Amussat mentioned a case of cancerous tumor of the breast, which he had just removed, and which, in the beginning, had presented all the characters assigned by M. Cruveilhier to fibrous tumors. He contests the opinion of this surgeon and that of M. Gerdy, that it is possible to establish a differential diagnosis between indurated (*dures*) tumors of the breast. The true plan, he contends, is to operate at an epoch as little distant as possible from the commencement of the disease, which is then in most of the cases circumscribed and susceptible of being totally eradicated.

M. Roux (*loc. cit.* pp. 212, 213,) persisted in maintaining the difficulty of diagnosing the benign tumors of the breast, and urged with all his zeal the necessity of operating on tumors of the breast in good season; at the same time repudiating with equal energy, the opinion of M. Hervez de Chegoïn, that we should defer operating for cancer to as late a period as possible. Here this interesting discussion closed. (*Sitting of the Academy, March 26, 1844—Journal des Connaissances, &c., Paris, May 1, 1844, p. 213.*)

The animated discussion which has taken place at Paris on *fibrous tumors* in general, and especially those of the *breast*, and the difficulty of establishing their true character and diagnosing them from cancerous and other tumors, has not ceased, but promises to incite to still farther and most important investigations. The researches, in fact, made with the *microscope*, bid fair to give a still greater value to that instrument than it acquired even in the time of Lewenhoeck, or than has been accorded to it for years past, which is not surprising, when we consider the mechanical improvements which art has effected in that powerful means of interrogating the internal structure of every kind of organization. (See our note on a certain fungous growth of the testicle, *infra*.)

M. H. Lebert, of Paris, has communicated to the public (*Gaz. Méd. de Paris*, March 8, 1845, tome XIII., p. 156 et seq.) some observations upon the results obtained by him in examining a tumor of the breast, which appear to us to possess a good deal of importance. The case which M. Lebert furnishes in illustration, was that of a

woman perfectly healthy in every respect, aged 32, in whom a tumor of the right breast had existed for ten years, but only latterly became exceedingly painful and enlarged, appearing to be a general hypertrophy of the gland, without adhesion of the teguments, or any feeling of isolated tumors in it, but somewhat painful on pressure. The pain caused by it warranted its removal by the surgeon, M. Lenoir. The microscope proved it to be a *hypertrophied portion of the mammary gland*, its general color white, and consisting of numerous globules, and these having throughout their interior smaller cellular globules, filled with a reddish fluid, which oozed out whenever the knife was applied. It had none of the characters of fibro-plastic, nor of cancerous tumors of the breast. The surrounding cellular tissue, by the long continuance of the disease, had also become so hypertrophied and thickened as to give it the appearance of a cyst. A *diagnostic point* elucidated by the microscope, and which went to show that this tumor was nothing more than *hypertrophied mammary tissue*, was the fact that it contained throughout *numerous large-sized nerves*, which afforded an explanation also of the acute pains, (not, therefore, to be confounded always with cancerous disease,) and proved its true character, for no accidental tissues of new growth contain these or other evidences of high organization. These results, moreover, confirm, as is remarked by M. A. Bérard in his recent work on tumors of the breast, the accurate knowledge which Sir Astley Cooper had of this kind of tumors. Those called *cysto-sarcoma*, as well as *fibrous* and *hydatid* tumors of the breast, all belong, M. Lebert thinks, to this species. The process of the formation of those under consideration he thinks is as follows: a portion of the mammary gland or of many of its lobes become the seat of a sanguineous afflux or local congestion, whence a more active nutrition and hypertrophy, both of this diseased gland and the surrounding normal celluloso-fibrous tissue. These lobes, as Sir A. Cooper says, become more prominent outwardly, and finally, are attached to the gland only by a mere pedicle, so as to appear sometimes quite distinctly separate from it. The *natural fibro-cellular* tissue which surrounds the mammary gland, becoming dense and hypertrophied more rapidly than the gland itself, is mistaken for a *fibrous* tumor, and when filled with an abundance of fibro-plastic, or gelatinous liquid, may have a *colloidal* (colloide) appearance. Or when this plastic fluid is deposited in the interstices of the fibrous tissue, it may form compartments (loges) which are ultimately transformed into small cysts, the globules of which may be considerably altered by imbibition. When these cysts exist in great numbers in the middle of the tumor, they take on the form of *mammary-hydatid*, which, however, must not be confounded with *serous-hydatid* tumors of the breast, or those which contain *ecchynocoques*, and which are sometimes found in the breast.

M. Lebert says, moreover, that those under consideration may acquire considerable volume; that they are more especially developed in young women; that they do not alter the general health; and especially do not contract adhesions with the skin which surrounds them, and that they leave the nipple (mamelon) intact: in all of which particulars it will be perceived his views differ in many points from those of M. Cruveilhier.

M. Mandl, (*loc. cit.*, *Gaz. Méd.*, p. 157, 158,) the celebrated micrographist of Paris, who also examined the tumor in question with M. Lebert, accords with him in the existence of mammary tissue in the portions submitted by them to the microscope. Nevertheless, positive as M. Lebert's opinions appear to be on its non-cancerous character, M. Mandl asserts that he satisfied himself that *cancerous globules* were also present. He states the important fact that we must not be deceived by the *usual microscopic form* which the elementary globules of cancerous tumors are known to have; for this is sometimes not present, and he then has been enabled by other physical characters, or by chemical or other means, (which he will in due time make public,) to establish the fact that such tumors were nevertheless of genuine cancerous structure. So of *encephaloidal* (so called) tumors of the retina, though sometimes destitute of globules of the cancerous form, he has notwithstanding found them to be unquestionably cancerous.

Mr. Liston speaks of what he calls *fibrous tumors of the mamma*, (*Lond. Lancet*, Dec. 7, 1844, p. 308, &c.) which form in the cellular tissue between the mammæ, the latter becoming expanded and flattened out in front of the tumor.

But neither these nor Sir A. Cooper's *hydatid or cysted* tumors, the cells of which latter Mr. Liston has seen sometimes filled with a fluid as black as *printer's ink*, are as frequent he thinks as *carcinomatous malignant* disease of the mamma. These may occur, but rarely, in women under thirty in perfect health, with uninterrupted catamenia. Most generally they occur between the ages of forty and fifty, and sometimes later. They commence between the nipple and axilla, and sometimes in the centre of the gland, and then attack the middle of the lactiferous tubes. Sometimes the tumor remains hard and stony, with the nipple retracted, skin puckered, &c.; but usually it makes rapid progress in size, becomes soft and pulpy, or pultaceous and medullary, and throws out a fungus which may or may not bleed profusely, depending on the constitution. A section of one of these tumors, says Mr. Liston, presents a variety of diseased structure: it may be *fibrous-looking*, that is, with *white bands* running to the cellular tissue; or present the appearance of a gelatinous cancer, or it may be pultaceous or medullary. Sometimes all these heterogeneous or heterologous tissues are found in the same tumor; or some portions are hard and others softened down; or the vessels will give way and extravasation of blood occur.

In mere hypertrophy of the gland, support given to it with moderate compression may restore it to its normal size. Dr. N. Arnott's mode of pressure Mr. Liston thinks is very ingenious, i. e. by a sort of wooden cup or bowl, made of the size of the tumor, and into which apparatus is placed a small air-cushion, made of very fine texture. The cushion is inflated with air, so far as not to be hard; this cushion is then put in the cup and supported by a spring like that of a common truss. This will answer also, Mr. Liston says, in many cases of simple tumor of the breast.

There are, he considers, some enlargements of the mamma where the structure is altered; not a simple hypertrophy,—but where there



are masses of fibrine agglutinated together, and where the tumor will go on increasing in spite of all that can be done.

Cystic tumors cannot be dispersed by simple compression. Sir B. Brodie has described certain tumors of the breast that have yielded to lotions of spirits of camphor with liquor plumbi kept on till the surface is inflamed, then omitted and reapplied.

The knife only, says Mr. Liston, can remove the disease when the gland is altered in structure and contains a great number of cysts; but such tumors are not as he conceives malignant, and if the whole mass is extirpated there is every chance that the disease will not return. There is no contamination of the lymphatics, and the removal of the breast in those cases, may be had recourse to with great propriety.

If a patient comes, says Mr. Liston, with a small tubercle in the breast, with some puckering and adhesion to the integument, if it feels exceedingly hard and unyielding, and has all the characters of carcinoma, but is of recent origin, and you cannot trace disease to the lymphatic system, you may be sometimes justified in taking the tumor out, but *you must take the whole of the mamma with it*. When the disease is at all advanced, and there is reason to think that the constitution is affected with it, it is far better to abstain from the proceeding. At one time, adds Mr. Liston, this was the most common operation in surgery. I recollect the period when a week seldom passed over without the operation being performed two or three times in our hospitals; but now it is seldom had recourse to, and properly too, except in cases of *non-malignant* disease.

Mr. Liston has seen a case of carcinomatous tumor of the breast in a female under 30, (see his Lectures, *London Lancet*, Dec. 21, 1844, p. 359, &c.) where the skin covering both sides of the chest and all around the back was affected, hard, unyielding and extensively pervaded by tubercles, to such extent that the motions of the chest and of the upper extremities were much impeded by the indurated state of the skin.

Cancers of the mamma may at an early period be disposed to involve the lymphatics, the same as in those of the lip. Even in malignant disease, Mr. Liston has known Dr. Arnott's mode of compression, if early and well applied, to cause the tumor in great part to disappear: but in other cases it causes great suffering; for it cannot be expected to liberate the system of the constitutional taint, which will then reappear in the neighboring lymphatics and at places far removed from the disease. Thus, though the fatty matter around the mamma has been absorbed by the pressure, and the tumor lies flat on the ribs, yet the disease goes on as if nothing had been done. Dissection in such cases has shown enough cancerous degeneration.

In *cystic and fibrous* tumors however, he thinks the operation may be undertaken with a very fair prospect of success; but sometimes the disease returns, and is sure to do so if the whole of the tumor is not taken away.

*Pseudo-Cancers*.—You meet sometimes with tumors, says Mr. Liston, (*Ibid.*, p. 359, 360, &c.) which are not *described in books*, and which you will scarcely believe malignant, or that they can possibly

return. He describes one of this kind in a stout healthy woman, only a little over 30, and in whom the lymphatics were not in the slightest degree affected. There was found a great deal of fatty matter around it, and its interior to his surprise consisted of a strange soft-looking mass, containing a great deal of *coagulated blood* and a quantity of clot without the coloring matter, but there was also curious pultaceous stuff amongst it. After this he was not surprised to find that the disease in a few months returned, showing itself in three or four fungous buds in the cicatrix. There being still no affection of the lymphatics nor of the axillary gland, Mr. Liston removed these, and with them, as the patient was so stout, an immense quantity of the surrounding tissue, skin, fat and even pectoral muscle, for the tumor adhered firmly to the fascia of this last and was incorporated with its fibres. The cure was complete, and remains so now, nine years since the last operation.

In *non-malignant* tumors, Mr. Liston has sometimes cut below the mamma and left that behind, but if there is adhesion to it the whole must be sacrificed.

In *malignant tumors* when extirpated, not only the diseased mass must come out, but you must be careful, he says, to cut out also a large portion of the apparently healthy fatty tissue around it, and keep the knife also much beyond and outside of the *white bands* which you will see spreading out from the central portion of the tumor into the fatty matter. After taking out the tumor, it is to be washed and scraped, and if any indurated portions be found on its surface, you must proceed to make further excisions from the corresponding parts of the wound.

It is a good rule, he thinks, to take away *the fascia of the pectoral muscle*; as the disease frequently has some connexion with it, and will recommence in this tissue.

Mr. Liston thinks it an advantage in the dressing to apply a layer of *gold beaters' skin* to the raw surface of the wound, to prevent this adhering to the lint, which is to be placed upon this intervening tissue.

Again, Mr. Liston disapproves of closing the edges of the wound tight at first with adhesive plaster, and by making firm pressure with compresses and rollers around the chest; as this causes pain and oozing of the blood, and the formation of putrid clots, fœtid discharges, &c., requiring the whole to be removed, and perhaps more vessels to be tied. He prefers merely the lint applied as mentioned above, wet for five or six hours, then one or two sutures, or more, may be required, and to terminate by bringing the edges together with *isinglass plaster*. Thus you will probably obtain union by first intention, and without discharge or pain.

The *male breast* occasionally will become affected precisely, he says, in the same way as the female, and require also removal, or it will end in internal malignant disease and death.

M. Lesauvage of Caen, (*Arch. Gén.*, Février, 1844, p. 178, &c.) disapproves of the word *fibrous*, and proposes, in lieu thereof, *gelatino-fibrous*, to such tumors as are described by our author, M. Velpeau, (*Dict. de Méd.*) as formed of *solidified or vitalized* (vivifiée) *fibrine or albumine*. M. Lesauvage says they are to be found in those regions that are abundantly supplied with cellular tissue, and that he

has seen them in the breast, scrotum, fold of the groin, posterior part of the thigh, mesentery, &c. They are always isolated, and possess a distinct organization within themselves of numerous cysts and blood-vessels, and incommode the neighboring parts only by their size, weight and pressure. In the breast they are always developed at the posterior part of the gland, which latter, when they are very large, is flattened out and covered by them on its anterior portion. M. Lesauvage does not describe these tumors, which he has seen return after extirpation, in *seven* instances, with sufficient clearness to enable us to appreciate probably at their just value the fruits of his experience. A discussion which has elicited such profound researches, microscopic, pathological and otherwise, from the most learned surgeons and investigators of Paris, cannot properly be participated in by others, unless they come duly armed with accurate and new facts.

M. S. Tanchou in a more recent work of his, (*Recherches sur le traitement médical des tumeurs cancéreuses du sein*, Paris, 1844,) boldly reassumes the prevailing popular doctrine of *conservativeism* and the substitution of *medical* treatment even in that most formidable of all surgical diseases, cancer. He maintains that by a proper medication the most clearly established and unequivocal forms of cancerous tumors of the breast, may be effectually arrested in the economy, and in their local devastation. He strongly censures the frequent resort to extirpation, where not necessary, and for alleged cancerous tumors that are not in reality cancerous. From a comparative table of deaths by cancer, at Paris and its environs, between 1830 and 1840, but from which no doubt there must be a great deduction made for errors in the true designation of this disease, as is justly remarked by the editors of the *Archives Générales*, (4<sup>e</sup> serie, t. VII., April, 1845, p. 523,) M. Tanchou asserts that this disease has increased in frequency from 1.96 in a 100 in 1830, to 2.40 in a 100 in 1840. But according to a more important table by Professor Rigoni Stern of Padua, (*Arch. Gén.*, loc. cit., p. 524,) embracing an interval of 80 years, viz., from 1760 to 1839, the same increase of mortality from cancer has taken place at the last mentioned city; viz., from 48 in 1000 between 1760 and 1769, it rose to 93 in a 1000 from 1830 to 1839; but this increase was exclusively confined to cancers of the *uterus*. Whereas, M. Tanchou states the augmentation in Paris to have taken place in all the most important organs and in proportion respectively to their greater degree of excitability or impressionability, and this in their physiological order. He however also admits that the increase has occurred to a greater extent in women. M. Tanchou imputes this increase of the disease to the effects of civilization, and in support of this, instances the less degree of frequency of deaths by cancer in the environs of Paris than in the capital itself: an error in the tables which, as is again justly remarked by the editors of the *Archives Générales*, (ib. loc. cit., p. 524,) is to be ascribed to the fact that the poorer class of patients in the suburbs most usually come for relief to the hospitals within the city proper.

*Fungus Hæmatodes occupying the entire bladder.*—Dr. E. Bissell, of Norwalk, Connecticut, (*American Journ. of the Med. Sciences*, new series, vol. VII., p. 122–124, Philad. 1844,) relates one



of the most extraordinary cases of isolated and sudden formation of malignant disease of the bleeding fungoid description on record. In the short space of one year, a man aged 67, who was of temperate habits and up to April, 1842, had enjoyed uninterrupted health and a sound constitution, was seized with irritation in the bladder and constant desire to urinate, followed by discharge of large quantities of blood, and distressing pain and exhaustion, which finally ended in death. The surgeon, previous to this event, diagnosed through the rectum and above the pubis, an enormous tumor occupying the whole bladder, and thus dispelled the illusion of gravel and stone, for which supposed diseases he had been for some time under treatment by an empiric. On examining the body, the diagnosis was fully confirmed. The tumor was ovate, and nine inches from above downwards, and about four and a half inches transversely. Its greatest diameter was naturally towards the abdomen and perineum, from meeting with less resistance in those directions. It was a true fungus hæmatodes, and originated near the neck of the bladder posteriorly. Its texture could be torn by the finger without much difficulty. The bladder was so completely filled up by it that there was not room for the smallest quantity of urine. The most remarkable feature is, that there was not a vestige of disease in the kidneys or other viscera any where!

A congenital *encephaloidal* tumor, or *encephalocele*, of an extraordinary character, proving on dissection to be a true *hernia cerebri*, has been recently described by Mr. W. Lyon of Glasgow, (*Lon. and Edin. Month. Journ. of Med. Science*, by J. R. Cormack, M. D., &c., Nov., 1844, p. 983; and the *London Medical Gazette*, July 12, 1844.) The child, aged nearly one month, at the time of the description of the case, exhibited an oblong tumor, chiefly over the occiput, and extending from the vertex to the nape, 11 inches in circumference, 9 in length, and 7 in its lateral dimensions, partially livid or marbled in color, fluctuating and *without pulsation*; traversed anteriorly by small tortuous vessels, and the parts not livid covered with thin soft hairs. No opening could be felt under its attachment to the scalp—the head was normal, but the forehead remarkably low, and receding—the child well formed, but weakly. The tumor being without pulsation and nearly as large as the head, and the cranium of normal size, were circumstances that *masked* its true character and led to the inference that it could not be connected with the brain or composed of cerebral matter. This opinion was strengthened by the fact that the fontanelles remained flaccid and could not be made tense by pressing on the tumor, as if to effect its retrocession by a hernial taxis. Gentle compression was tried, but soon abandoned. Finally, the edge of an opening into the cranium could be felt. The child lived just a month, and the tumor, on dissection, was found to contain 3 oz. of bloody serum, and its parietes to be formed of the scalp, pericranium and dura mater. Portions of the posterior lobes of the cerebrum, about the size of a small apple, covered by the arachnoid and pia mater, having a film of serum between them and the dura mater, projected through an opening in the inferior and middle part of the occipital bone into the sac, being of the size of the point of a finger, with rounded edges, and situated immediately above the *tenorium*, which was imperfect. It was bounded above by the termi

nation of the longitudinal sinus, at the sides by the lateral sinuses, and below by the incomplete tentorium. The portion of brain in the tumor was compressed where it passed through this abnormal foramen, and bulged out to the size of a small applé in the interior of the sac. There was no fluid within the cranium, either beneath the membranes or in the ventricles. The substance of the brain was quite normal. The impacted state of the parts about the occipital opening, no doubt prevented pulsation from being felt externally.

Cases of this description, though possibly beyond the reach of surgical aid, are rendered exceedingly valuable by the difficulties and delusions with which a post-mortem may show the diagnosis to have been necessarily embarrassed.

Even the *brain* itself is not exempt from the formation of *scirrhus tumors* within its substance. A remarkable case of this kind is related by M. Frestel, (*Gaz. Méd.*, de Paris, April 19, 1845, p. 253,) of an infantry soldier of young and robust constitution, who was received into the hospital of Saint-Lô, and who, after months of acute suffering from pain in the occipital region, but what is unaccountable, without, so to speak, any fever, or the least deviation of any of the mental or physical functions from their normal state, except perhaps a slight defect at times in the articulation of words, ultimately died suddenly without convulsions. The organs of the different cavities and the cerebrum itself was also found normal, except that there was a considerable quantity of serosity in its ventricles; but on examining the *cerebellum*, its entire left portion was found disorganized, increased in volume, and having small but well-marked mammillary eminences on its superior surface. The inferior and posterior part contained a tumor of the size of a large nut, supported on a distinct pedicle. The right portion of the *cerebellum* was in a measure healthy. The tumor was hard and resisting to the touch, and of a tallowy (*lardacé*) aspect, and when cut into exhibited the characters ascribed by authors to scirrhus tissue. T.]

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## CHAPTER XI.

### TUMORS OF THE BONES (EXOSTOSES).

Under the title of tumors of the *bones*, my intention here is to speak only of the class of tumors designated by the name of exostosis. Surgical remedies are not applicable to all the varieties of exostosis. So long as the malady is still the seat of an inflammatory process, and that it presents the slightest character of osteitis, acute or sub-acute, there would be danger in attacking it with instruments, and the operation would be absolutely without any result. It is its cause that we must extinguish, and not the exostosis, which we have to treat. In the acute state or in a state purely chronic, exostoses, developed under the influence of syphilis, or any other general infection, are equally repugnant to every kind of surgical operation, so long as the

germ has not been completely destroyed in the system. Should the exostosis be complicated with caries, necrosis, tubercular, sarcomatous or other degenerescence, it is still to these last affections that we must address ourselves, and not to the exostosis, properly so called. Finally, operative surgery ought moreover to exclude from its domain diffused, large or fusiform exostoses, and those which comprise the whole circumference of cylindrical bones, or the entire thickness of the large bones to a great extent. I will add, that limited exostosis, more or less completely pediculated, ancient and indolent, which is almost the only kind that ought to be attacked, would not of itself justify serious operations, unless by its situation or volume, it should in reality cause a great disturbance in the exercise of some of the functions, or unless it should trouble in too serious a manner the regularity of the features and forms of the part. Exostoses being very common, have naturally very early attracted the attention of surgeons. Heliodorus (Peyrilhe, *Hist. de la Chir.*, p. 391, 392.) who seems to have been acquainted with eburnoid exostosis (l'exostose éburnée), positively recommends their removal. The ancient Greeks, who often employed the hot iron in place of the cutting instrument in such cases, also made use of both these means at the same time. J. L. Petit (*Œuvres Posthumes*, t. II., p. 27,) who adopted the same method, adds that exostoses which have not been dissolved neither by mercury or other internal remedies, ought to be destroyed by means of the exfoliating trephine, chisel and mallet, (*Maladies des Os.*) About the same epoch Duverney (*Maladies des Os*, t. II., p. 500,) a rival of J. L. Petit, laid down the following principles: if the exostosis has not a large base, it is to be removed, he says, by means of the rasp, chisel or saw; when the exostosis, on the contrary, is large, we ought to give the preference to the exfoliating or ordinary trephine, taking care to place the crowns by the side of each other, in order afterwards to drive out and to remove by means of the strokes of the chisel the bridges that remain between them. The red hot iron and caustics found, at the beginning of the 18th century, a decided antagonist in Kulm (*De Exostosi*, etc., 1732; *Thèse de Haller*, t. V., p. 653.) Extirpation with the knife, says the author, is the only remedy for exostoses, all other means being doubtful and uncertain. Lecat, wishing to reconcile the various ancient modes of practice, recommended in 1755, under the anonym of Labissière, (*Prix de l'Acad. de Chir.*, t. VII., p. 157, in-12,) the excision of exostoses which have a tendency to imposthumate or which are limited to the interruption of certain functions; the hot iron against those which are complicated with fungosities and deep-seated caries; delay for those which no longer make any progress and which do not cause any accident. This doctrine did not prevent Allan (*De Exostosi*, § 12; *Thèse*, 1770) from proposing the removal of exostoses in two stages. Having incised the integuments, scraped the periosteum, and dressed the wound dry, Allan recommends that we should, on the following day, apply a sufficient number of the crowns of the trephine; that we should then, by means of the gouge and mallet, drive out the osseous bridges, and terminate by rasping the bone which sustained the exostosis. It is readily conceived that this method could neither be



agreeable to the taste of the patient or the surgeon, and that Nicolas (*Dict. de Chir. et de Méd. et de Vétér.*, t. I., p. 521, 522,) who simply recommended to saw through the base of the exostosis, when it is narrow, found more sympathy among practitioners. Since then an attempt has been made to systematize these different modes.

B. Bell (*Cours de Chir.*, t. V., p. 314,) and Maune (*Maladies des Os*, p. 19–33–35) after him, have established, that an exostosis ought to be attacked with the trephine, if it can be included in the crown of the instrument, and with the ordinary saw when it is too large—When the exostosis surrounds the whole circumference of the bone, we must, say these authors, exsect or amputate the part, whether it exists in the small bones of the feet and hands, or even when it is situated in the thigh, leg, or arm. Petit-Radel (*Encyclop. Method.*, partie Chirurgicale) in such cases also recommends to exsect the cylinder of the bone, rather than confine ourselves to the excision of the exostosis. Surgeons, nevertheless, have pursued a more simple practice. With Voigt (Plouquet, *Suppl.*, p. 53, col. 3,) the extirpation of an exostosis succeeded very well and enabled him to preserve the continuity of the part. M. A. Cooper (*Œuvres Chirurg.*, translation of Bertrand, t. I., p. 306) recommends removing them with a saw, and says that the operation, which under such circumstances is accompanied only with a slight pain, does not in general involve any danger when it has been well done.

The ligature mentioned by Klein (Sprengel, *Hist. de la Méd.*, t. VIII., p. 341,) does not in reality deserve a refutation, since it appears so entirely foreign to the treatment of exostoses. In conclusion, it is not, in fact, allowable to undertake the removal of these tumors, unless it should appear practicable to reduce them by means of the saw, or to destroy them by the chisel or the trephine. By means of the cultellaire saws, the chain and rowel saws, and the improved osteotomes, which science possesses at the present time, there is scarcely an exostosis, with a strangulated or pediculated base, which cannot be readily extirpated. The operative process being simple or complicated, much less from the nature or form of the exostosis, than from the anatomical arrangement of the organs which surround or sustain it, cannot be well understood except when treating of exostoses in particular. It is, moreover, evident that certain of these tumors, those especially which are superficial and perfectly pediculated, are generally easily removed. An empiric (Guérin, *Essai de Méd.*, t. II., p. 276, an VI.) supposing that he was about to lay bare a lipoma, having perceived his error and recognizing before him an enormous exostosis, isolated it down to the level of the sound bone, and succeeded in detaching it by means of a common carpenter's saw: the patient got well.

## ARTICLE I.—EXOSTOSES OF THE TRUNK.

### § I.

On the *cranium*, the extirpation of exostoses has not always been unattended with inconveniences; it is moreover easily performed. Having laid bare their root by means of suitable incisions, nothing

prevents our dividing them either by the ordinary saw, the hand-saw, or the trephine. Nevertheless, I would recommend that on this part of the body we should not have recourse to the gouge and mallet, unless it were necessary, and that in order to avoid all cerebral concussion, we should confine ourselves to the employment of the different kinds of saws which I have just spoken of. Arnaud, (*Mercur de France*, Janvier, 1716,) speaks of an exostosis four inches long and two in breadth, which was situated on the top of the head of a domestic, and which was first attacked with a trephine. Perceiving that the tumor was osseous throughout its whole substance, the surgeons deferred the operation until the next day. Serious accidents which came on in the night, obliged further postponement, and the patient succumbed at the expiration of three days, without the autopsy throwing any light on the cause of so sudden a death. We also find in Sauvages (*Nosologie*, t. VI., p. 235,) the history of a patient who had in the auditory passage a tumor that was taken for a foreign body, but proved an exostosis, which was attempted to be extracted, but soon caused death. M. A. Cooper, (*Œuvr.*, trans. of Bertrand, t. I., p. 310,) cites a case of fungous exostosis of considerable size, which occupied the two tables of the frontal bone, and which was excised, but in such a manner that the person operated upon died on the sixth day. We must not, therefore, undertake the ablation of exostoses of the cranium without necessity, nor resort to this grave remedy unless the tumor has excoriated and ulcerated the tissues, and that it is entirely external or threatened with some degenerescence.

## § II.

The *bones of the face* have still more, perhaps, than the bones of the cranium been the seat of exostoses, and for which serious operations have been fearlessly undertaken. It is to be remarked, in fact, that in this region surgeons have obtained numerous successful results. Brutner (Koenigsberg, 1775, observ. premiere) speaks of a patient who, in consequence of a fall when six years of age, had on the jaw an exostosis which was extirpated eleven years afterwards, and which then weighed six ounces. Reisinger, (*Bull. de Ferussac*, t. XI., p. 361,) states that he successfully removed from the upper jaw, an exostosis of certain volume by means of Thæter's saw, when all other processes had failed. Should the exostosis occupy the lower jaw, it must be destroyed in the same manner. Jourdain, (*Maladies de la Bouche*, t. II., p. 123,) in order to remove one which was situated on the outside of the jaw, incised and dissected the gum around it, to detach it by means of a flat slightly curved chisel with a sharp edge. The actual cautery was afterwards found necessary, to destroy a purulent exudation from the traumatic surface, and the patient recovered in 34 days. This method, recommended by Blicke, has been favorably received by M. A. Cooper, who, in a case analogous to that of Jourdain, detached the exostosis by means of the bistoury, and afterwards deemed it necessary to apply the cautery to the bottom of the wound. Other cases of exostoses of the jaws destroyed by the instrument or by the hot iron, have also been reported by Harrison,

(Sprengel, t. VIII., p. 366, 1832,) Mosque, (*Ancien Jour'n. de Méd.*, t. LXXI., p. 506,) and Verduin, (*Thèses de Haller*, t. V., p. 69.) One of the most curious examples of exostosis of the face, successfully removed, is that related by Vigarous (*Opuscles sur la régénération des Os*, p. 170.) The tumor occupied the vault of the palate, and extended from the neighborhood of the anterior palatine foramen, as far nearly as the uvula. Its largest diameter was ten lines. The surgeon having assured himself that it was only soldered as it were against the bones, attempted to detach it without penetrating into the nasal fossæ. There remained around the cavity where it was situated an osseous border, which afterwards came away in fragments, and did not prevent the cure from being accomplished in the space of a month. Should the exostosis be situated in the vicinity of one of the alveolar borders, the cutting pliers, which I mentioned under the article of *exsection of the jaws*, would render its excision one of the easiest things imaginable; Liston's scissors would be equally applicable to it, should it be dilated, while presenting at the same time a root that was slender and of sufficient length. Wounds of the face, moreover, reunite with so much facility that incisions should not be spared in this region, should it appear that they would render the destruction of the exostosis more easy and more certain.

### § III.

In exostosis of the *sternum*, I have met with but one instance in which its form and character would admit of extirpation. The tumor was of the size of a pullet's egg, and its root one-half less in diameter than in its dilated portion. It was laid bare by two curved incisions, which detached an ellipse of the skin in front; its section was afterwards made by means of two cuts of the crested saw, directed first from right to left, then from left to right, and as near as possible to the anterior plane of the bone. The borders of the wound were then gently brought together and the operation was unattended with any serious consequences.

### § IV.

I have also, in two instances, met with exostoses on the apex of the *spinous processes* of the vertebral column, and which I might have extirpated, in one case, on a level with the projecting vertebra, and in the other, in the lumbar region. But nothing was done to remedy this deformity.

### § V.

The *bones of the pelvis* sufficiently often present these kinds of exostoses. A patient had one of very large size on the pubes, which caused him a good deal of suffering. M. A. Cooper (*Œuvr.*, transl. of Bertrand, t. I., p. 320.) effected its removal, using Machel's saw to begin with, and finishing with that of Hey. The cure was completed in a month. I have met with a young man who had on the outside of the spine of the ilium, on the left side, an exostosis a half an inch in thickness, half a foot long, and near twenty lines in breadth, which was situated transversely, and caused, moreover, no



pain, and had, according to the patient, been developed in less than two years. The young man was not willing to submit to any operation for his relief. I have met with exostoses in the same situation in three other persons; but in these cases they were of such considerable size that I have not thought it necessary to recur to surgical means. Exostoses in the interior of the pelvis, are among the most frequent that we meet with, the proof of which I have given elsewhere, (*Traité d'accouchements, Vices de conformation, Accouchements contre nature*, etc., 2d edition;) but as they are beyond the reach of operative surgery, it is useless at this time to examine them.

Plessman, who asserts that he destroyed one on the anterior surface of the sacrum, by means of the actual cautery, has not been relied upon by any one, and has left it to be inferred, that the tumor he refers to, was one of an altogether different description.

## ARTICLE II.—THE HAND.

### § I.—*Hand.*

In the limbs especially, exostoses require all the attention of the surgeon. Covillard (*Obs. iatro Chirurg.*, p. 97, obs. 36, 1739,) extirpated one under the name of a wen, (*loupe*), of a cellular texture, of the size of a pullet's egg, and transparent as a crystal, and which extended from the phalangeal articulation of the little finger to the middle of the hand. The incision of the soft parts having been effected, Covillard made use of a shoemaker's knife to complete the operation, and his patient recovered. An exostosis of considerable size, which was situated upon the same finger, and which incommoded only by its size, was also at a later period successfully removed by Bidloo (*Exercit. Anat. Chir.* 9, *De Exostosis*.) It must be that these exostoses of the little finger are quite common, for M. Champion, also, gives two examples of them: in the first case (communicated by the author) a bosselated transparent tumor, of the size of a goose's egg, was situated upon the inner side of the first phalanx of this finger. Having operated in the manner I have described in speaking of exostosis of the sternum, the surgeon made use of a solid scalpel to force out (*faire sauter*) the exostosis, and afterwards had recourse to the gouge, to remove everything from the phalanx, that had the appearance of being expanded (*raréfié*), fungous (*carnifié*), or diseased. In the second case (*Thèse* No. 11, Paris, 1815, p. 61; obs. 10) the tumor was situated upon the outer side of the forefinger, towards the middle of the first phalanx. It was of the size of a nut, and other practitioners had proposed to destroy it by amputating the finger. An osseous tumor of three inches and a half circumference, developed itself upon the second phalanx of the forefinger; Vigarous (*Œuvr. Chir.*, p. 458,) made an incision, which included the entire base of the exostosis, and enabled him to detach it in two successive stages, by means of a fine saw, by removing half the corresponding metacarpal bone, and then the forefinger itself. The same practitioner, also, had to remove from the outer side of the right middle finger, what he called an osseous *loupe*, and which kept the two fingers six inches apart. This tumor, which was seven or eight times

larger than the bone which sustained it, and which formed a kind of shell to it, was filled with matter resembling tallow or honey. Vigarous (*Opusc. sur la Régén., &c., p. 172.*) removed the first phalanx of the diseased finger, together with the second bone of the metacarpus, and cured his patient in the space of six weeks. M. A. Cooper, also, speaks of an exostosis which occupied the second phalanx of one of the fingers. The first ablation was followed by a return, but the second effected a radical cure. In another case, Vigarous encountered an osseous *loupe*\* on the first bone of the metacarpus. This tumor, which was thirteen inches and a half in circumference, at its dilated portion, and nine inches at its root, appeared to have been developed at the expense of the second and third bones of the metacarpus, as well as of the first.

## § II.

I have seen exostoses on the *fore-arm*, which were in some instances globular, and at other times *styloidal*. But the patients experienced so little inconvenience from them, that they never thought of having them removed.

## § III.

The *humerus* occasionally presents on its outer side and near the shoulder, an osseous tumor, the extirpation of which has already been several times attempted. The first example of the kind which has been spoken of among us, belongs to Ant. Dubois. I have heard this surgeon relate that the exostosis, which was concealed underneath the deltoid muscle, was situated nearly two inches below the articulation; that it was of the size of a large pullet's egg, and that it became necessary to cut through the muscular fibres, in order to lay it bare, after which he made use of the ordinary saw, gouge and mallet to complete its extirpation. In another case which I have seen, the tumor was situated precisely in the same region, and presented nearly the same volume. M. Roux, who performed the operation, being desirous of saving the deltoid muscle, made a long incision on each side of it, so as to leave a kind of musculo-cutaneous bridge between them. The blade of a common saw, detached and passed under this bridge, and afterwards re-inserted into its handle, served to make the section below the pedicle of the tumor. As this saw could not be worked in a direction parallel with the axis of the humerus, it was necessary to make use of it a second time, and then to have recourse to a sort of file to equalize the surface of the bone. An abundant suppuration and accidents of quite a grave character supervened, but the cure ultimately was completely established. At the present time we should have to choose between three processes: One would consist in laying bare the tumor by cutting a large triangular or V flap, which should be raised up upon its base. After having applied pieces of pasteboard or linen to protect and depress the borders of the wound, the exostosis could be readily extirpated

\* The word *loupe* literally and anciently means a *wen*; and afterwards it became synonymous with *lipoma*, from whence it is probably derived. (See on Lipomatous Tumors, *supra.*) Its use in the case mentioned here and farther back, shows that it was applied to the reverse of wens and fatty tumors, viz., to those of an osseous, and also transparent texture. T.

by means of the ordinary saw, which it would be more advisable to work from below upwards than from above downwards. By a second process we might confine ourselves to cutting down upon the tumor itself, through the whole thickness of the tissues, from the apex of the acromion to the point of the deltoid, and then push back the lips of the wound to the right and to the left, to enable us to apply the saw upon the pedicle of the exostosis; but this process would not be applicable but to exostoses which make a very considerable projection, and which are elongated and have a narrow pedicle. The third, which is no other than the process of M. Jeffray, for the exsection of the elbow, and which M. Roux has proposed to put in practice, should at the present time be performed in the following manner: the two lateral incisions being made, we should carefully isolate the bridge and soft parts from the contour of the tumor. The cultellaire saw or one of the other hand-saws somewhat narrow, or even the osteotome of M. Charrière, would readily divide, either from one side to the other or from above downwards, the pedicle of the exostosis. No doubt also the articulated saw would answer the purpose equally well. All that would now remain, would be to thrust out and extract the foreign body through one of the openings destined for the passage of the instrument. But at the present day when we know how harmless is the division of muscular fibres, who would expose himself to the difficulties of this process, when that which I have pointed out above, renders the operation so easy and so simple? Exostoses are sometimes found also upon the shoulder. I have already mentioned, in speaking of exsection, or extirpation of the clavicle, that the history of a tumor of this kind which had two feet in circumference, and which weighed five pounds, and was a foot in length, had been given by Kulm. The tumor was removed, without, however, his mentioning very clearly whether the clavicle had to come away along with it at the same time.

#### § IV.

Lobstein (*Compte-Rendu du Musée de Strasbourg*, 1834, p. 64, no. 79,) says that an exostosis which was situated upon the *scapula* of a young man, was extirpated, and that the cure was effected in two months and a half. A child thirteen years of age, had upon the lower angle of the right shoulder blade, an exostosis of the size of a large egg, one half of which projected outwardly, and the other inwardly. The surgeon, M. W. Beaumont, (*Gaz. Méd.*, 1838, p. 778,) by excising with the saw or Liston's cutting pliers the angle of the scapula, which he caused to project between the latissimus dorsi and serratus magnus muscles, while raising up the arm of the patient, in this manner removed the tumor, and succeeded in obtaining a perfect cure.

#### § V.—The Foot.

Exostoses of the feet are met with especially upon the phalanges of the toes. André (*Observations sur les Maladies de l'Urét.*, p. 410,) speaks of an exostosis of the size of a large cherry, which was situated upon the *great toe*, and which he was unable to remove until after having cauterized it several times with *eau mercurielle*.



Having elsewhere spoken (see Vol. I.) of sub-ungueal exostoses of the different toes, described in a particular manner by Dupuytren and M. Liston, (*Bull. de Férussac*, t. XIV., p. 255.) who with myself prefer in such cases amputation of the last phalanx to excision of the exostoses, I will refer the reader to those remarks. There have been met with on some of the bones of the metatarsus, exostoses which require a little further attention. It was in an instance of this kind that B. Bell (tome V., pp. 314, 315,) decided on extirpating completely one of these bones for an exostosis, which occupied its entire circumference. M. Herpin (*Constitution Médicale d'Indre-et-Loire*, p. 15, 1er trim. 1818,) speaks of an exostosis of three inches in circumference, which was situated upon the *first bone of the metatarsus*, and which he removed in the spring of 1806, by means of a small saw, after having laid bare its root by an elliptical incision. The bottom of the wound was cauterized with red hot iron, and the patient radically cured. There is frequently found upon the dorsal surface of the great toe, near its anterior extremity, a conical shaped exostosis, which it may become advisable to extirpate. A straight incision and one cut with the pliers, are generally all that is required for it. As, however, there is a mucous bursa there, which is sometimes continuous with the neighboring joint, it is advisable not to operate there without some degree of caution.

#### § VI.

In the leg, exostoses are found upon the fibula, tibia, and patella. M. A. Cooper relates that he saw a cartilaginous exostosis of the size of a chesnut, underneath the periosteum, an inch and a half below the head of the fibula. The extirpation of this tumor was performed by M. Leving, (A. Cooper, *Œuvr. Chir.*, transl. of Bertrand, t. I., p. 519,) who had recourse to the crucial incision, and divided the fibular nerve before removing the tumor with Hey's saw. The cure was effected in a month. A patient operated upon by V. Moreau, (communicated by M. Champion, who witnessed the fact,) was less fortunate. In a peasant girl, there was an exostosis of an eburnoid character (de nature éburnée) and large base, situated upon the antero-external side of the body of the tibia. This tumor was laid bare by means of a quadrilateral flap, and then removed by the aid of the gouge, chisel and mallet. This was in 1794; accidents supervened, and the patient died. In another case, a boy of fifteen or sixteen years of age, the exostosis, which was seated upon the spine of the tibia, had acquired the size of a Saint-Jean pear. The dissection of a triangular flap allowed of rasping the bone and embracing the exostosis in the aperture of a piece of tin plate, and thus exsecting it, without injuring the soft parts. The wound was united by first intention, and the cure, according to Bourqueneau, (*Annal. de la Soc. de Med. Prat. de Montpellier*, t. VII., p. 424,) was completed in the space of fifteen days. Finally, M. A. Cooper gives a case of exostosis with narrow base, situated underneath the periosteum at the antero-superior part of the tibia, and which, after having made an elliptical incision in the soft parts, was successfully removed by means of an amputating saw, directed from above downwards, and then from below upwards. A slight exfo-

liation, which took place subsequently, did not prevent a radical cure from being accomplished.

#### § VII.—*The Patella.*

Vigarous, (*Œuvr. Chir. Prat.*, obs. 112, p. 557,) who has gathered in his work so many extraordinary observations, speaks of an exostosis or osseous steatoma, which grew on the anterior surface of the patella, and which was 25 inches in its circumference and was covered with four ulcers. Amputation of the thigh had been proposed, but Vigarous undertook to remove the tumor without interfering with the articulation. He effected this by means of several incisions and by sundry cuts of the saw. Some osseous laminæ exfoliated at a later period, but the operation, which consumed only fifteen minutes, was followed by complete success. As for the rest, it would appear from the description which this author gives of it, that this tumor, which was filled with soft matter, and osseous only upon its exterior, belonged rather to the class of degenerated hematic tumors than to that of exostoses properly so called.

#### § VIII.

The lower third of the femur is perhaps the region of the osseous system where pediculated exostoses acquire the greatest volume, and are most frequently met with. I have seen them sometimes on the inner and sometimes on the outer condyle of this bone, and near the ham, and either acuminate or globular, and of the dimensions of half an inch to an inch in height. Those which more particularly require the attention of the surgeon, are such as have a tendency to develop themselves above the inner condyle, sometimes in front and sometimes behind. This is a kind of exostosis which is scarcely mentioned in authors, and which has this remarkable character, that the tumor is almost always found with the same features, and in the same place. M. A. Cooper, (*Œuvr. Chir.*, transl. of Bertrand, t. I., or translation of Chassaignac, p. 608,) who relates two examples, says, that in one of his patients the exostosis, which he denominates cartilaginous, was situated underneath the periosteum, a little above the inner condyle of the femur, and that it occasioned quite a considerable degree of pain. The exsection was made without implicating the muscles, by means of a saw which it was found necessary to fix by hooks, requiring afterwards the removal of some osseous asperities by means of cutting pincers. In the other case, the tumor, which was situated in the same place, and occasioned some inconvenience in the movements, was laid bare by an incision, which had to include some fibres of the sartorius muscle, through which the exostosis was extracted after Machel's saw, directed by the inventor himself, had divided its neck. I have already met, in six or seven instances, with the species of exostosis I have just described. In the first case it seemed as if the tuberosity of the inner condyle had been transformed into a long and strong coronoid process. The patient, who had been in this state for fifteen years, had become so habituated to it, that he would not hear anything said on the subject of an operation for his relief.

In the second case the tumor existed in a young man accustomed

to make voyages. It had the form and size of a small melon, and was situated underneath the vastus internus muscle, two or three inches above the articulation. The idea of an operation, and the apprehension of danger, have hitherto deterred the patient, who, however, suffers from it in no respect whatever.

The third case is that of a servant, seventeen years of age, who came in April, 1835, to the public consultation of the hospital of La Charité. The exostosis in him was precisely similar to that of the preceding patient, both in situation, form and volume.

In a fourth example, which I saw in 1836, the patient was forty-five years of age, and could not indicate the origin of his exostosis, which was also situated upon the inner side of the femur, at some inches above the knee.

It was in November, 1838, that I met with the fifth case. This last case was a man of about sixty years of age, who states that he has had it about thirty years, and that he attributes it to a badly-treated fracture of the thigh. There is every reason to believe, however, that there is nothing very authentic in this history. The abdominal limb in fact has no shortening, and the bone, in other respects, is perfectly regular. The tumor, which projects two inches and a half on the inside of the femur, which is three inches in diameter at its largest part, quite strongly bosselated, and situated at the union of the middle with the lower third of the thigh, exhibits at its root a contraction (*étranglement*) sufficiently marked to forbid the idea of imputing it to a morbid (*vicieux*) callus. A young boy, twelve years of age, had one of the size of a pullet's egg, a little lower down, which gave him no trouble, and for which he did nothing. The same was the case in a patient whom M. Macgloshlin took me to see in 1837.

It is a matter of surprise that we should so often meet with tumors of this description in such a region. None of the patients I saw were in any other respect annoyed except by the size, weight or deformity of the tumor. Thus there were no sufferings, no lancinating pains, no excoriations nor inflammations, nor adhesions of the skin or other tissues. So also did these patients, when I pointed out to them some of the dangers they might incur in undergoing an operation, come to the determination to retain their infirmity, and recoil from the operation, and perhaps they acted wisely. Ought we, however, on that account to say that supra-condyloid exostosis of the femur is absolutely incurable? No, certainly; but to remove it we have to resort to an operation, sometimes difficult, and almost always dangerous, whilst the disease in itself does not usually compromise the functions of the limb or the general health of the individual, and may remain stationary for an indefinite number of years, when it has once arrived at a certain period of its growth. The conclusion, therefore, in my own mind is, that I would not decide upon the removal of tumors of this description, unless, notwithstanding my representations, the patients should find themselves so much incommoded or annoyed as to make an urgent demand for relief, or unless such tumors should threaten to acquire too large a volume, or to undergo degeneration, or cause, in fine, actual pain, or serious functional derangement in the part. As for the rest, there is no other treatment for them but excision or extirpation, in which event many processes may be employed. Should



the exostosis be flattened and of small diameter, we lay it bare by means of a simple incision, commenced above and terminating below, and which ought to penetrate down to the bone. The cutting pliers, Liston's scissors, or one of the exsection saws, will then suffice for excising it from the femur. When it does not appear practicable to isolate the whole contour of the tumor by means of a straight incision, we may then choose between the crucial incision, that of the T, the double vertical incision of Jeffray, or the semilunar. The crucial incision would have no other inconvenience than that of completely dividing, and in two opposite directions, all the fibres of the vastus internus muscle. Nevertheless this difficulty ought not, at the present day, to deter us, if by that means we should render the operation more easy, inasmuch as the section of the muscular layers involves in reality but very slight inconvenience. The T incision might be made in such manner that its horizontal branch could be placed in front or behind the tumor, almost indifferently. I should, however, prefer to place it in front, in order that its vertical branch might be made to fall upon the inner border of the ham, and permit the two flaps which it circumscribed to be reversed, the one downwards and the other upwards and backwards. The incision with two parallel branches, one situated in front and the other behind, so as to circumscribe a bridge of soft parts upon the exostosis, has in this region still greater inconveniences than for sub-deltoidal tumors of the humerus. M. Roux, who made trial of it in the young servant whom I have mentioned farther back, was obliged to divide the soft parts transversely through their middle, transforming it in this manner into two quadrangular flaps. Besides creating in this manner embarrassment in the section of the tumor, we expose ourselves moreover to the risk of not being able afterwards to disengage it from among the muscles, and effect its complete extraction. It is therefore more prudent to resort at first to the semilunar incision. This incision, whose free border should be turned inwards, would circumscribe a flap, which should be reversed from behind forwards, and would lay bare the whole of the exostosis. An assistant drawing this flap upon its base and outwards, while another assistant would hold apart the inner lip of the wound backwards and inwards, and while the limb was held in semi-flexion, and lying on its outer side, would enable the surgeon to carry any saw whatever very near the femur, and to divide the neck of the exostosis. If there should remain any asperities or osseous inequalities at the bottom of the wound, nothing would be more easy than to remove them by means of the chisel, gouge and mallet, or by the aid of the rasp or the concave rowel saw of M. Martin. We might also confine ourselves to a straight incision, placed on one of the sides of the tumor, and which should be sufficiently long to enable us to separate its borders wide apart. The osteotome of M. Heine, or the saw of M. Charrière, or even that of Aitken, introduced by this means upon the pedicle of the tumor, would evidently enable us to detach it in the greater number of patients; and everything shows that by giving the incision a certain extent, it would give free egress to the foreign body. It is perceived, moreover, that the process in these cases ought to vary according to the size, form and actual seat of the tumor, or the particular taste and practice of the

surgeon. I would only remark, however, that in general the semilunar incision is the one that should be adopted by preference. Up to the present time, this operation has not been performed sufficiently often to enable us to appreciate exactly either its dangers or harmlessness. The two patients of M. A. Cooper, did not recover without causing some uneasiness; and that of M. Roux, who, though he was young, of excellent constitution, and in perfect health, ultimately perished. The surgeon, being obliged to penetrate down to the bone, necessarily arrives beneath the fascia lata. Being unable to detach the exostosis without more or less contusing the neighboring tissues, and without making a wound whose bottom is hard and more or less rugated, he can scarcely count on immediate reunion. But if the inflammation and suppuration, which in such cases would almost inevitably supervene, should take on a diffused character and extend downwards towards the ham, and upwards into the body of the thigh, they would soon constitute one of those forms of phlegmonous erysipelas, or diffused phlegmons, which are the most formidable that can be imagined. I would therefore lay it down as a precept, whenever immediate reunion, and without suppuration, cannot succeed, that we should not attempt the cure of the wound by first intention, but confine ourselves to keeping it slightly open by means of small balls of lint, until it is perfectly cleansed, and that there has been formed the pyogenic membrane and cellulo-vascular vermilion surface.

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## CHAPTER XII.

### THE LIGATURE IN MASS.

We have already seen in the preceding volumes under how many forms the ligature is employed in surgery. Useful for uniting certain wounds, almost indispensable around vessels, to arrest the blood in amputations, for wounds of arteries, aneurisms, and most bloody operations, it is, so to speak, called for as often as we take the bistoury in our hands. But in such cases the ligature includes and constricts only the vascular canal, whose orifice or calibre we wish to close. But there are a class of operations in which we apply the ligature in a different way. In these we no longer apply it on a distinct vessel at the bottom of any wound, nor is it now designed to repress the effusion of blood; its object here is, by strangulating the parts, to mortify, sometimes, quite a considerable portion of them left outside of it. It is to this last kind of constriction that the title, in our times, is given of *ligature in mass*. It is thus that polypus has been treated at every epoch, whether situated in the nose, the womb, or rectum, or even in the ear. Most pediculated tumors have also been treated at every period of science by the ligature in mass. Even amputation of the limbs has been sometimes performed in this manner. I have related several examples of this kind under the chapter on Amputations in general. When castration is performed, it is allowable to embrace the whole of the testicular cord in a ligature, and to

strangulate it in mass. The ligature for fistula in ano, so frequently employed in the last century, was nothing more than the ligature in mass. We see by these examples under what circumstances the strangulation of the parts ought in reality to receive the name of ligature in mass, and to how many and to what kind of operations this description of remedy is applicable. To effect it the surgeon may make use of all the different kinds of ligatures imaginable; those of silk, thread, linen packthread, cord, fibres of plants, lead, silver, gold, platina, and maillechort, rendered flexible by the various means known in the arts, furnish the same resources for the ligature in mass as for the simple ligature of vessels or for sutures. Nevertheless, we cannot indifferently employ any one of these substances in preference to another. Should we require a ligature somewhat small in size, and which should be at the same time very supple and strong, the silk ought to be preferred. If it is required to effect a firm constriction of a soft tissue with a root somewhat large, a ligature of hemp, made by twisting three, four or five strands of simple thread, presents the most advantages. Packthread, which might be substituted for it, has the inconvenience of adapting itself with less facility to the bottom of the parts, and of untying itself too easily. It is advisable, moreover, in place of besmearing them with soap, as some persons have recommended, to rub the strands of the thread or packthread with wax, which prevents, or at least diminishes, its tendency to slip. Tissues of plants or ligatures of linen ought not to be employed unless none better can be obtained. As to metallic ligatures, however pliant some may consider them, they never possess the flexibility of thread, and cannot obtain the same generalization in practice. They consequently ought not to be preferred, unless there is necessity of a very great degree of constriction, or to put ourselves on our guard against the dissolution, putrefaction, or physical alterations of the ligature. There are also some cases where substances, which would be susceptible of solution and absorption by the living organs, might have an advantage. Thus to strangulate an intestine, either transversely or on its side, and in such manner as to return it immediately afterwards into the belly, it would be a precious advantage to have the use of ligatures which, as soon as they were applied, would cease to act as a foreign body. For this purpose there has been used silk in its natural or raw state, deerskin, chamois leather, gold beaters' skin, catgut, &c. But in addition to the fact that ligatures or threads fabricated out of these substances, are deficient in solidity, they have moreover the inconvenience of not being absorbed, except in a few cases, without exciting inflammation or suppuration. The ligature in mass is not applied in all cases in the same manner. If in some cases we limit ourselves to encircling the part by placing the ligature immediately upon the skin without any previous incision, we on other occasions commence by dividing the integuments upon the same circle which is to receive the ligature. These two modifications of the ligature in mass were known at a very ancient period. In the method known as M. Mayor's, and which, since the time of Hippocrates, all surgeons occasionally employ, we commence by laying bare and dissecting the parts which it is our intention to destroy, and it is not



until after we have isolated them nearly down to their root, that we surround them with the ligature and strangulate them. This last method is daily applied, as it has been for ages past, for the extirpation of tumors of the axilla after the removal of cancers of the breast, also in the ligature of the spermatic cord, etc. The various modifications of the ligature in mass are nevertheless all classified under two general methods, viz: the ligature without previous dissection of the integuments, and the ligature after the dissection of the tumor.

#### ARTICLE I.—LIGATURE WITHOUT DISSECTION.

The ligature in mass, without previous dissection, comprises three varieties: the thread or ligature is applied on the integuments without any other precaution, or after a circular incision of the skin, and sometimes also after having cut through the tissues behind the root of the body which is to be destroyed. The ligature upon the integuments, whether they are cutaneous or mucous, is effected by means of all the different kinds mentioned above. Some surgeons of former times, and some practitioners of the ancient academy of surgery, had proposed in such cases to saturate the ligature with some caustic matter, in order, they said, that it might more rapidly cut through the tissues. This precaution, which rendered the operation obviously more painful, augmented the inflammation, and did not sensibly hasten the fall of the ligature, and which moreover rendered it more brittle, is no longer employed in our time. It is by a mechanical action, and not by its chemical properties that the ligature, thus applied, is to produce its effects. This description of ligature, which is applicable to cutaneous tumors, whether they are fibrous, vascular or horny, when they have a narrow root and are easily raised up, is equally applicable to bodies that are fibrous, mucous, or of any other character, which are found in the interior of the mucous cavities. To accomplish it we require a ligature properly prepared, and of a strength, breadth and thickness proportioned to the volume of the tumor, or the degree of constriction to be used. The ligature being arranged, the surgeon causes the tumor to be raised up in such manner as to surround its root a little behind it, and upon the sound tissues. If the pedicle of this tumor is purely cutaneous, there is no danger in strangulating it. When it is rather more cylindrical or conical than dilated (*renflée*), we may limit ourselves to applying the ligature upon its neck without making the least traction upon it; on the contrary it may be advantageous to raise it up with a certain degree of force while we are applying the ligature, if we do not wish to incur the risk of leaving behind a certain portion of the degenerated tissues.

It sometimes happens, that, in order to prevent the ligature from slipping, from the integuments towards to the tumor, we are obliged to give it certain points d'appui on the confines of the diseased region. It is in this manner that an erigne, a tenaculum, or a hook forceps with very convex teeth, sometimes becomes necessary. The tumor being drawn upon by an instrument of this description, obliges the ligature to glide backwards, in proportion as it is tightened. As it is

sometimes necessary that this last precaution should be rendered permanent, it has been proposed to pass, at first, a simple metallic stem, or two similar stems crosswise, under the root of the tumor, in the manner I proceed, and as M. Davat has done, for the ligature in mass, on varices. These stems, having transfixed the tissues firmly, retain the ligature, which is placed behind them; in this manner we strangle without any great degree of difficulty, and circularly non-pediculated tumors. I have mentioned farther back, what has been obtained from this description of ligature, in the treatment of erectile tumors. As it is difficult to strangle the parts completely when they have a considerable degree of thickness, it was readily suggested, that we should embrace a portion only of the base of large sized tumors with each ligature, to pass two, three or four ligatures in order afterwards to mortify separately each of the parts, or one of the four triangles of the pedicle, when the threads have perforated it crosswise. Should it be desired to apply a double ligature, we take a long waxed thread, with a needle, pierced near its point, and having a handle, or a long common needle slightly curved, or a probe, inserted in a canula which a trochar had previously enabled us to plunge through the tumor. We pass the thread behind the root of this last. Having immediately cut it near the needle, or disengaged it from the eye which conducted it, the thread is instantly un-doubled; we then seize hold of one of its halves which is tied into a knot on one side, and then do the same with the other, on the opposite side, taking care to tighten them in a proper manner. In this way, the ligature strangles only a portion of the mass. As it acts, moreover, from within outwards, it produces as much effect as if the tumor was only half the size that it is. If, as M. Warren (*on Tumors*, etc., p. 418) appears to have often done, we should incline to divide the tumor into four parts, by means of threads, it would be advisable to insert the four ligatures in succession, and to give the preference to the needle of J. L. Petit. Each thread would thus circumscribe a quarter of a circle, and the entire circumference of the tumor would finally become strangulated. Finally, it would also be practicable to imitate Sommé, who, wishing to divide the bridle of a pseudarthrosis, plunged in his ligature, and brought it out by the same opening, after having passed it around the tissues to be divided, a method, which, as I have elsewhere said, appears to have also been made trial of for varices. We should, therefore, insert by puncture, and sub-cutaneously, by means of a needle slightly curved, or any other instrument, a ligature upon the contour of one of the halves of the mass. Brought again, by a second puncture, to the opposite extremity of the great diameter of the tumor, the ligature would be conducted in the same manner upon the other side, and brought out at its point of departure. We should, in this way, procure a circular constriction, which would in no respect interfere with the integuments, and perform an operation entirely under the skin. A last mode of strangulation, without previous dissection, and which has already been employed by some surgeons, by M. Manec among others, consists in introducing as far as the centre of the tumor, four metallic stems, each armed with a hook, which, darting through it in the manner of a spring, afterwards divides the tissues from the cen-

tre to the circumference by means of a quick screw adjusted to their free extremity.

## ARTICLE II.—LIGATURE IN MASS, WITH DISSECTION.

The surgeon has often a good deal of embarrassment when completing the separation of tumors that are deeply situated, or organs whose pedicle is nourished by numerous vessels, which cannot be seized without difficulty, or that are of large size. This is seen in the extirpation of the tongue, the removal of cancerous tonsils, the thyroid body when degenerated, and in most of the tumors of the neck, axilla, groin, &c. It is easy to be conceived, that the surgeon, who has to extirpate a cancerous tonsil or tongue, must necessarily be intimidated with the hemorrhage which may result from such an operation. All extirpations of goitre have also been considered formidable from the same danger. M. Mayor, (*Essai sur la Ligature*, etc., Lausanne, 1821 ; *Essai sur la Lig. en Masse*, Paris, 1826,) in giving more importance than any other person to this inconvenience in bloody operations, has suggested that a ligature which would embrace the root of the tumor, would enable us to penetrate deeper down than with the bistoury, while offering, at the same time, to the operator all the security desirable. So that the ligature in mass, with previous dissection, and which was formerly but seldom had recourse to, is now in sufficiently general use. It is effected, moreover, with the same substances, and by the same processes, as the preceding method. Thus, in order to accomplish this, we may make use of threads, of silk, hemp or flax, ligatures of linen, packthread, or cord, wires of lead, silver, or other flexible metal or the different kinds obtained from animal tissues. In the same way as for the ligature in mass, externally, we might imbue the thread with caustic or medicated material, or apply it without any other precaution, upon the root of the tumor, and prevent its slipping by the various means employed to arrest the knot in the ligature upon an artery. If the body to be strangulated is voluminous, it is advisable, at first, to perforate it with a double ligature, the two portions of which are afterwards separated, in order to form a distinct circle, applied to each half of the pedicle we wish to mortify. Nothing, moreover, would prevent our dividing the root of the tumor into four portions, by means of four separate ligatures ; but the ligature in mass, with metallic wires, would be applicable after dissection only, to tumors whose entire contour and root passed beyond the level of the integuments. If, however, in order to effect its strangulation in a proper manner, it should be thought advisable to insert the metallic stems crosswise, through its root, it would still be practicable to recur to this, provided we took care to withdraw them shortly after, that is to say, as soon as the ligature had cut sufficiently deep into the tissues to prevent it from any longer having a disposition to slip.

## ARTICLE III.—MANNER OF EFFECTING STRANGULATION BY THE MASS.

The object here is to interrupt all kind of circulation and physiological action in the mass whose pedicle is constricted. The



better way would then appear to be, to strangulate the parts at first as powerfully as possible. Nevertheless, the ligature in mass is sometimes employed in such manner as to cut or strangulate only by degrees, the organs which it embraces. If the ligature has but little volume and acts insensibly, it may happen that the first organic layers cut by it do not mortify, but even reunite external to it, so as to imprison it, before its action has been brought to bear upon the tissues which are deeper situated. M. Mirault noticed this in a case of strangulation of the tongue; what I myself have also seen, and what J. L. Petit had already noticed after a ligature in mass upon the testicular cord; which result I have witnessed also in the case of a child who had strangulated the penis with a simple thread. This species of constriction, therefore, is for the most part very uncertain. Nevertheless, there might be cases where it would be advisable, provided that by thus cutting through the tissues by degrees without mortifying them, some prospect might be obtained of effecting a radical change (*modifier profondément*.) in their morbid condition. We shall find, in fact, in speaking of operations performed upon the tongue, that the patient treated in this manner by M. Mirault, ultimately recovered of his cancer. If, however, the strangulation at first is sufficiently powerful to arrest the passage of the fluids, the tumor, which is immediately deprived of its vitality, first becomes blue and livid, and then softens, shrinks and loses its volume. From this it happens that the ligature is no sooner sufficiently tightened, than it slips and is displaced, and no longer makes any constriction. In this point of view, practitioners in my judgment appear to have examined but one of the points of the question. If the ligature changes place before the entire physiological circulation in the tumor has been suspended, it is clear that life may be re-established and that our object will be defeated. If, however, this displacement does not take place until at the expiration of 24 hours, or in consequence of the shrinking of the tissues, our purpose, nevertheless will be attained. After this first result, however, the consequences will be the same, whether the ligature remains or is removed. Every thing existing external to the ligature is effectually mortified, represents an eschar, and acts in the same way as a foreign body which must necessarily come away through the eliminating powers of the system. We see in these cases a line of demarcation established between the living and dead parts, while a process takes place in every respect analogous to that which detaches the eschars from a burn. For which reasons, my rule is to remove the ligature at the end of one or two days, when it incommodes, or when it is not my design to increase its constriction from day to day. As to the manner of performing this strangulation, it presents a certain number of modifications.

### § I.—*Simple Strangulation.*

Whether the ligature to be applied is to be external or deep-seated, we nevertheless frequently confine ourselves to strangulating the pedicle of the tumor by a double or even a single knot, in the same way as in tying an artery. Nevertheless, as it is almost always necessary to constrict the parts as strongly as possible, the first knot requires to

be firmly secured while we are adjusting the other. To effect this we have three resources: 1. An assistant holds the extremity of one of his fingers accurately placed upon the crossing of the threads, while the surgeon prepares the second knot of the ligature; 2. should the finger be found too large for this purpose, we substitute for it the blunt extremity of any metallic instrument whatever; 3. or what is still more secure, we firmly embrace the first knot with the point of a forceps. Still another means consists after the first knot is made, in carrying the two portions of the ligature again around the tumor, in order to knot and tighten them in the same manner upon the opposite side. Whatever mode is adopted, it is advisable to cut one or both of the free portions of the ligature near the knot. We cut both, should nothing prevent our seizing hold of, and dividing the knot at its place, when we judge proper. We leave one, on the contrary, when we consider it advisable that we should have a guide to remove the ligature at a proper time. If the ligature is intended to be temporary, we might, after having tightened it, adjust its first knot by a simple rosette (bow-knot). By this means we may readily withdraw the ligature at the end of one, two, three, or four days, and disembarass the parts without dividing anything.

## § II.

In place of this sudden strangulation, we sometimes have recourse to a graduated constriction, a constriction which, notwithstanding the shrinking and withering of the divided parts, shall act in such manner that the strangulation of those which remain, is not at all relaxed, but continued up to the time of their complete separation. For this purpose, quite a number of different modes have been devised. One of them is so ingeniously arranged that the ligature tightens itself in proportion as the tissues recede. To accomplish this M. Pelletan has contrived an instrument more ingenious than those of Levret, and which is represented by a stem with a double canal, having at its free extremity a sufficiently powerful spring, which receives the extremities of the ligature which have been previously passed around the tumor, and which constantly tends to make traction upon them, (*les entrainer*). Others have invented ligatures whose constriction may be augmented or diminished at pleasure. All the kinds of knot-tighteners (*serre-nœuds*) nearly, belong to this description. Whether, in fact, we make use of the *serre-nœud* of Levret, that of Deschamps, Desault, Dubois, or even the simple bow-knot, we may, nevertheless, renew at pleasure the degree of strangulation we have at first produced. When we have surrounded the tumor with a metallic thread, it will be sufficient to twist the two free portions in a spiral manner around each other, if we wish to make daily increase of the constriction. The most ingenious instruments we possess of this kind are those of M. Bouchet, M. Mayor, M. Graefe, and Dupuytren.

The knot-tightener of M. Bouchet is a sort of rundlet traversed by the two threads, and around which they are attached in order to be shortened to the degree desired. M. Mayor, reviving an idea formerly thrown out by Roderic, has proposed to pass the two united extremities of the noose of the ligature which surrounds the tumor,

through a series of beads or small balls of wood, ivory, horn, bone, silver or any other substance, in the manner of stringing the beads of the Paternoster. The first of these beads being pierced with two holes, allows of tightening the two halves of the ligature strongly upon the last, and of forcing the other in a proper manner against the tumor. To do this with still greater ease, we may replace the outer half of this chain of beads by a metallic or ivory tube, and make use of a small winch (*treuil*) to receive the extremities of the ligature. We have, by this means, a ligature which terminates in a flexible stem, which adapts itself with facility to the parts, and interposes no obstacle to the gradual strangulation of the tissues. The knot-tightener of M. Graefe, as modified by Dupuytren, receives by one of its extremities the double thread of the ligature. This ligature is then attached by several turns to a small lateral nut, (*écrou*), which is separated from or approximated to the wings or outer extremity of the instrument at pleasure, by means of a quick-screw, (*vis de rappel*.) (See article, *infra*, on *Polypi of the nose, uterus, &c.*)

#### ARTICLE IV.—APPRECIATION.

The ligature in mass, applied exclusively and alone, and adjusted by a common knot as near as possible to the root of the tumor, more frequently answers the purpose than is generally supposed. It is in fact, in most cases, not at all necessary, as some think, to renew the constriction and tighten the ligature daily. I have seen enormous tumors yield to this kind of constriction kept up for twenty-four hours, or even in some cases for only twelve hours. An immense polypus of the pharynx and nasal fossæ thus strangulated for the space of some days, and divested of its ligature a long time before it had been completely cut through, nevertheless separated at its root. How often have we not seen polypi of the uterus, treated by the ligature, detach themselves beyond the point which had been touched (*touché*) by the thread, and although the constriction had been actually maintained only for the space of a few hours! Nevertheless, this species of strangulation is not as suitable as the others, when we have to include a great mass of tissue. It is in such cases that partial or progressive strangulation merits the preference. Partial strangulation by means of threads passed through the tumor, acts more promptly and with more certainty than the simple ligature; but it is applicable only to external tumors, and would not be adapted to those whose pedicle includes voluminous vascular trunks, or large sized nerves. Here, therefore, we should make use of gradual strangulation. Underneath the skin this last mode would, at first, present great difficulties, and would not probably succeed until after having transformed the tumor into a vast abscess, at the same time without giving assurance that the integuments would be preserved. The process of M. Manec is, undoubtedly, the most difficult and most embarrassing, and the least certain of all. By means of knot-tighteners, should we use that of M. Pelletan, the results we would produce could only be imperfect and incomplete. The instrument of M. Graefe, when a straight and inflexible stem, is not attended



with any serious inconvenience; or on the contrary, the chaplet of Roderic, as improved by M. Mayor, may enable us to dispense with the others, and presents all the requirements of force and simplicity desirable. As for the rest, it is not to be forgotten, that the operation is practicable with all these instruments and by all these processes; which, nevertheless, does not exempt me from adding that the ligature in mass never should be the method of election, when it is practicable to employ the cutting instrument without manifest danger. The ligature in mass, used in the manner I have described, causes the separation of the tissues at the expiration of a period of time, which varies between three or four days and two or three weeks.

During all this period the tumor passes into a state of putrefaction, is decomposed, and emits an odor which is usually offensive, together with discharges which possess a certain degree of acrimony. Hence the extremely unpleasant consequences, both to the patient and those who approach him; and hence the real dangers which may result from this state of things by means of resorption, infection or poisoning. I have, therefore, been in the habit, when I have employed this operation, of excising from a half an inch to an inch of all that portion of the ligature which was found outside, as soon as the circulation appeared to me to have been sufficiently destroyed in the centre of the tumor. I remove the ligature itself at the end of four or five days, when this first excision convinces me that there no longer remains any degree of vitality in the circle of the constriction. The patients are thus relieved from an actual pestilential ulcer, (foyer,) and they have nothing more to undergo than the eliminative process from all the different points, similar to that which detaches the eschars from a burn, contusion, or gangrene. It is nevertheless true, however, that with the exception of a small number of cases, the ligature in mass will always be the favorite operation with surgeons who have but little experience with the knife, or not much confidence in their anatomical knowledge, or the steadiness (*sûreté*) of their hand. No one, however, as I think, would undertake to contend, that an operation finished in a few minutes, and which leaves a fresh and living wound, can be where all other things are equal, less advantageous than an operation which cannot be completed in less than from eight to fifteen days, which is accompanied with all the phenomena of gangrene, and the wound made by which does not begin to become cleansed, until at a period when that of the other may be perfectly cicatrized.

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## CHAPTER XIII.

### FOREIGN BODIES.

Numerous foreign substances, and of different kinds, may exist in the human body, and require the intervention of surgery. Some-

times these substances come from without, and at other times form in the midst of the parts themselves. The sequestra of bones, eschars within the soft parts, certain accidental productions, different sorts of calculous concretions, the decomposed products of fecundation, whether uterine or extra-uterine, &c. &c., belong to the last-named class. Substances derived from three kingdoms of nature, and which, having once entered into the living cavities or tissues, are arrested there as anomalous, and remain there as morbid causes, are to be enumerated under the first class. The organs most exposed to these kinds of accidents, are the ear, frontal sinus, eye, nares, mouth, maxillary sinus, the air passages, œsophagus, urethra and bladder, vagina and womb, and the rectum and intestines in general. It will be while examining the operations required for the diseases of these different organs or regions (appareils) that the occasion will present of speaking, also, of the foreign bodies which are found in them. I do not therefore intend, at this moment, to treat of other foreign bodies than those that are attached to, or formed upon other regions of the animal economy.

## ARTICLE I.—TRUNK.

### § I.—*The Head.*

In this series we shall find foreign bodies in the head, face, chest and abdomen. Projectiles thrown by powder, as powder itself, lead, and especially balls, langridge (mitraille) discharges from bombs, or howitzers, biscayans, and even small bullets, are frequently found there. Then come pieces (tiges) and fragments of metal, wood, wadding, clothing, flints, portions of glass, &c. There are no regions where these different foreign bodies have not sometimes been encountered. A ball which was found near the gullet, (*Transact. Phil.*, 1738, p. 449, art. 6.) had entered there by passing through the lower jaw and tongue a year before. A dice (dé) entered from the pharynx of a child into the pterygoid fossa, (Parrish, *Encyclogr. des Sc. Méd.*, 1836, p. 321.) I have removed, through the mouth, a ball which a boy, aged fifteen years, had driven by the discharge of a pistol into the body of the fourth cervical vertebra. Marchettis (Bonet, *Corps de Médecine*, t. III., part 2, obs. 25, p. 230.) speaks of the fragment of a fan, which having been introduced through the orbit into the upper maxillary bone, made its way out, and was extracted in part externally, and partly through the palate, at the expiration of three months. A man, fifty years of age, whose case is given by Muys, (Planque, *Bibl.*, t. I., p. 43, in 4°.) had in an abscess below the ear, a portion of pipe which he had forced into his throat six months before. Percy (*Manuel du Chirurgien d'Armée*, p. 109.) relates a great number of cases where various foreign bodies had in this way become lodged in the head. A patient mentioned by De La Motte, (*Tr. Compl.*, t. I., p. 718, ob. 205,) received a sword thrust between the gum and nose, and the weapon breaking, perforated near the ear and remained of the thickness of a farthing external to its place of entrance. The wound cicatrized over it, suppuration took place near the ear, and no attempt was made to extract the foreign body. A man, in despair from being paralyzed, discharged a pistol into his

mouth. The following day he told me he had felt the ball descending into the stomach, and he was no longer paralyzed! Watching the symptoms, I noticed, on the eighth day, a slight degree of emphysema over the left eye. I cut down and extracted the ball, which had shattered and contused the orbital arch. This patient was cured both of his wound and paralysis. In the case of a wound, related by Donnadieu, (*Anc. Journ. de Méd.*, t. VIII., p. 549,) the point of a copper spindle remained for thirteen months fixed in the cheek and one of the jaws. At first its presence was not noticed. A sinuous ulcer finally disclosed it, when the metallic point was extracted, and the cure took place. Courgeolles (*Ib.*, p. 551,) makes mention of a fragment of wood, which having become implanted or imprisoned in the bone near the supra-orbital notch for the space of fourteen years, had produced no other result than a warty excrescence, which successively disappeared and returned without the patient taking any farther notice of it. In F. de Hilden, (Bonet, *Corps de Méd.*, p. 160,) we find the history of a ball which had remained for six months between the cranium and dura mater. A patient of Morand, (*Opusc. de Chir.*, p. 159, 1re partie,) who died at the expiration of nine months, presented a similar fact. Analogous cases have been related by a great number of surgeons, and especially by M. Larrey, who also speaks of ram-rods traversing the cranium without causing immediate death. An example of this kind has just been published by M. Zedleg, (*Gaz. Méd.*, 1838, p. 379.) A ball had been retained for eighteen years above the orbit, in the substance of the frontal bone on the right side, and the patient, who in other respects had been in quite good health up to that time, died of apoplexy. Thomassin, (*Extraction des Corps étrangers*, etc., p. 16,) in the case of a child aged twelve years, saw an arrow forced through and through the apex of the cranium, but which, however, was extracted, with a successful result. A patient who had carried for the space of four months a similar body in the brain, was cured by M. Majault, the father, (*Mém. de l'Acad. de la Chir.*, t. I., p. 316, in 4°.) but Majault, the son, operating at the expiration of eleven years for a similar lesion, lost his patient on the third day, (*Journ. de Méd.*, t. XLI., p. 82.) Solingius (V. D. Wiel, cent. 11,) was more fortunate, and succeeded in extracting from the cranium a portion of the blade of a sword, which had broken there after having entered by the great angle of the eye. The point of a poignard, which had broken in the cranium, and which at first could not be extracted, became detached almost of itself at a later period, (Bartholin, cent. 4.) A portion of the stock of a musket, which had been for two months in the brain without causing any accidents, after being extracted, was followed by death, (*Journ. de Méd.*, t. I., p. 242, obs. 8.) [See remarkable and recent cases of these injuries in our notes under *Trephining*, Vol. II.]

## § II.—Thorax.

If we pass from the head to the *chest*, we shall find that an ear of wheat, (A. Paré, liv. 25, chap. 16,—Bally, *Revue Méd. Franc. et étrang.*, etc.) and needles and pins swallowed by accident, have made their way through the lungs, and finally, after having produced



an abscess there, and sometimes even without any previous morbid changes, have finally shown themselves under the skin. Every body knows the case related by Gérard of a knife blade which had become fixed in a rib in such manner as to project into the interior of the thorax more than from the outside of the rib. Bidloo, Bagieu, Desport and M. Terrin, mention cases where they had to extract balls from between the ribs, where they had either entered or were making their egress. Wherter, (*Journ. Gén. de Méd.*, t. LXIX., p. 423,) on the authority of the military surgeon Hunter, mentions a biscayan of three ounces which, after having fractured the ribs, lost itself at the depth of five inches in the lungs. The fragments of broken bones were exsected, the foreign body extracted, and the patient cured; but this account is so problematical that we may place it by the side of that which mentions a ball of seven pounds' weight which had travelled into the haunch! Broussais (*Histoire des Phlegmasies Chroniques*, 2e edit.) speaks of a soldier who died at the expiration of fifteen or twenty years, with a ball in the lungs, without any person having suspected it; and Thomassin (op. cit., p. 96,) relates that he found a ball in the right lung of a man who died at the expiration of three weeks from wounds disconnected with this last. Briot (*Hist. de la Chir. Milit.*, p. 97,) cites a case where a ball, after having passed through the scapula, became wedged in between two ribs.

Having dilated the wounds and glided the beak of a spatula behind the foreign body, its extraction was effected while the patient made a strong inspiration. In the memoirs of M. Larrey, (*Ibid.*, t. IV., p. 259,) we find the case of a ball, weighing ten drachms (gros), which had perforated the thorax between the eighth and ninth ribs. The surgeon could not effect its extraction until after having notched out, by means of a blunt-pointed bistoury, the whole breadth of the lower rib, down to within two lines above its arterial border, to such extent that the patient, in a sudden flexion of the trunk, fractured the rest of this bone, wounded the intercostal artery and produced a hemorrhage, which was finally restrained, but not without difficulty, by means of the process of Desault. The same surgeon had, moreover, some time previously, extracted a ball weighing six drachms without previous exsection of the bones. A girl who received the discharge of a pistol in her back, died on the twentieth day. The ball which lacerated (rompu) says F. Plater (Thomassin, op. cit.) the spinal marrow had implanted itself into the body of the ninth vertebra. M. Burnes (*Archiv. Gén. de Méd.*, t. XXVIII., p. 411) speaks of a fork which was extracted from the back of a patient without its being known how it had entered there. Foreign bodies of another description also, have quite frequently been found in the body (epaisseur) of the chest. I will relate here two singular cases. A convict died of a visceral affection at the hospital of Rochefort (Guillon, *Presse Médicale*, t. I., p. 151.) In this man a *foil* (fleuret) was found in the chest which had transfixed it completely, one of the extremities being in the substance of one of the ribs, and the other in the body of a vertebra, while the middle portion, covered with stalactites, was enclosed in the body of the lungs. It was ascertained that the wound had been made fifteen years before, and no one sus-

pected that a foreign body of such a character existed in the thorax of the patient. A case not less remarkable, but in which the consequences were more disastrous, was presented at La Charité, in 1836. While on exercise, an officer of the National Guards, of Paris, received in his back a musket ram-rod of large calibre. This rod penetrated to the depth of fifteen inches, taking an oblique direction from the left dorsal region to the right breast. Traction made by a number of surgeons, and men of great strength, near Sceaux, where the accident happened, could not in the least degree move the foreign body. I was enabled in the evening to examine this patient at the hospital, whither he had been removed. After the facts communicated to me, and after comparative measurements of the remaining portion of the ram-rod and the musket, with another ram-rod of similar calibre; and after having struck several times upon the metallic point, which projected about five inches from the dorsal region, I had no doubt that it had perforated through and through the thorax. No serious accident had yet occurred, and the patient suffered but little. What in such a case was to be done? The removal of the rod might give rise to a hemorrhage and effusion of blood which might suddenly prove mortal; there was room for apprehending that the aorta, vena cava, or even the heart might have been transfixed (*embrochés*)—[this conjecture scarcely seems supportable, T.]—and that in removing from them the species of plug which had shut up their perforation, the sources of life would have been instantly extinguished. But by leaving it in its place could we, on the other hand, hope that the wounded man would survive? For how could we conceive that a rod like this, traversing organs so important, would not soon give birth to accidents that would prove speedily fatal. The case of M. Guillon was not then known to me, and if it had been it would have strengthened me in the step I deemed it proper to take, which was that of delay.

This course, moreover, was one of necessity. Our surgical resources, rich as they already are, have nothing which would enable us to extract a body of this description. I hoped that the process of supuration taking place around the foreign body, would soon render it movable, and allow of its being removed, at the same time that it would obliterate the vessels, if any had, in reality, been wounded. At all events, I caused to be constructed, by the ingenious artist, Charrière, an instrument which would have carried out my views, had not the patient, in spite of the most rigid antiphlogistic treatment, succumbed at the expiration of four days, almost suddenly, without having given any positive evidences of pneumonia or effusions in the chest. The opening of the dead body disclosed to us, that the rod had traversed one of the dorsal vertebræ, at a line in front of the spinal canal; that afterwards, grazing the vena cava ascendens, and passing under the base of the heart, it had passed through the lung to arrive between the ribs under the right breast, where it still remained. The larger vessels and the heart were intact. The lung, though slightly engorged, was not inflamed; it would appear that death had been caused by the effusion of a certain quantity of blood into the bronchial tubes, (*les bronches*), laid open in the track of the rod. I then made an essay with the instrument of

M. Charrière, and we found that it would have perfectly fulfilled the indication. This instrument is composed of a large metallic plate, which was intended to have its support upon the back, after having allowed the projecting portion of the rod to pass through it. This last being admitted into a solid tunnel, or sort of socket, itself sustained upon the plate mentioned, furnished support to a nut, by which the action would have been made upon the foreign body without any unsteadiness, and in a gentle manner, after the manner of a quick screw from before backwards, permitting all the force requisite to be used, and that without exposing to any kind of concussion. If this instrument, which could not be completed until the day the patient died, had been accessible at the first, perhaps I should have had recourse to it: would the patient, in that case, have survived? This is precisely the question which will always cause the greater number of surgeons to hesitate under such circumstances. I will nevertheless add, that hereafter, notwithstanding the case published by M. Guillon, and the defence of it by M. Larrey, I would adopt the resolution of extracting the foreign body, rather than abandon its dislodgement to the resources of the organism.

[The difficulty in having at our disposal the ingenious contrivance mentioned, is that such accidents are too rare to have these apparatus on hand, already fabricated. The principle, however, could be very readily adapted, we should think, in a few minutes, to a temporary construction. This case vividly calls to mind the unparalleled one in our notes, Vol. II., under *Trephining*, of a long sharp chisel, implanted deep into and through the vertebral column, and which, by herculean efforts, was extracted on the spot, the proper course undoubtedly. T.]

### § III.—*Abdomen.*

Foreign bodies in the abdomen, like those of the thorax, arrive into this cavity sometimes directly from the exterior, sometimes after having passed through the mouth and œsophagus. A boy (Planque, *Bibl. de Méd.*, t. I., p. 46,) thirteen years of age, having swallowed an *ear of barley*, discharged it three weeks after, by an abscess which was formed in the left hypochondrium. The same accident was followed by the same result, in a little girl in Silesia, (*Journ. des Savants*, October, 1688.) When balls, lead or other projectiles strike the abdomen, they enter into the peritoneum, or are arrested in the thickness of the soft parts. In the last case, the foreign body should be extracted without hesitation, by the ordinary processes. Should the ball have dragged in with it in such manner as to have pushed ahead of it, and become wrapped up (*de manière à en rester coiffée*) at the bottom of the passage, in a portion of the clothes of the patient, nothing more would be required than to make action upon this last, in order to remove the whole. It is what I did successfully in two of the wounded in 1830, and each of whom had received a ball, one below and to the right of the umbilicus, and the other to the outside and left of the same point. Supposing, on the contrary, the projectile had fallen into the peritoneal cavity, and that there was no means of ascertaining precisely its exact situation, every attempt at extraction would be fruitless, and in fact extreme-



ly imprudent. It is difficult to conceive, therefore, how the contrary rule should have been reproduced in a recent treatise upon wounds from fire-arms, and that a surgeon should not hesitate to advise that the abdomen should be freely laid open, and that we should perform a sort of gastrotomy, to go in search of balls that have wandered among the convolutions of the intestines. Once in the belly, the ball may cause there various disorders. In a man who had received the discharge of a pistol, and whom I saw with Bogros, the ball had opened the hypogastric vessels, and speedily caused death. A similar fact has been published by M. Gibson. It is known that Carrel died of a wound of the intestines, and that the ball in him remained in the belly. Though in such a case we should even succeed in withdrawing the projectile, what would thereby be gained? It is the wounds it has caused, and not its presence, which is the source of the danger. Who, moreover, does not know, that balls, lead, and buck-shot, left in the midst of the tissues, become encysted, and frequently remain there a considerable length of time without materially disturbing the functions? Does not M. Larrey (*Clin. Chir.*, t. II., p. 521,) inform us that balls which had traversed the pelvis, rectum and bladder, have nevertheless not prevented the wounded from recovery? If the projectile was still in the tissues, we should even take care, while trying to extract it, that we do not cause it to fall into the belly or pelvis, as happened to that practitioner mentioned by Theden, (Thomassin, op. cit., p. 31.) As to foreign bodies that have arrived through the digestive passages, they have given rise to certain results, exceedingly curious. Legendre (*Biblioth. de Planque*, t. III., p. 560, in-4°,) speaks of an individual who, after a certain lapse of time, discharged per anum a *fork* which he had swallowed. Who is not familiar with the history given by Habicot, of the poor boy who, to protect them from robbers, decided upon swallowing his ten pistoles of gold, and who after being on the point of being suffocated, discharged them piece by piece, through the anus, during the space of fifteen days? A curious history of this kind is that of Pierre Yvens, related in the Journal of Bléigny (*Nouv. Découv.*, Mai, 1679, p. 188; et *Bibl. de Planque*, t. I., p. 51.) This man, who was an extravagant character, swallowed the steel (affilior) of a hog-killer, and retained it thus during five or six months. Not until then did an abscess form in the right hypochondrium, and allow the unfortunate porker to recover his instrument, which he had believed lost forever. Some time after, this foolish sort of fellow swallowed in the same way the leg of a porridge-pot, which he voided by an abscess in the left hypochondrium. Attaching no importance to these abscesses, Pierre Yvens took it in his head also to swallow a pocket-knife with its handle, (gaine,) which at a subsequent period came out above and by the side of the lumbar vertebrae. A. Paré also relates (*Traité des Monstres*, liv. 25, chap. 16, p. 772,) upon the authority of Cabrolle, the history of a shepherd who was compelled by some robbers to swallow a *knife* half a foot long, and which remained in his body during the space of six months. An abscess having formed below the groin, allowed of this foreign body being extracted from it. Besides the other analogous facts related by Paré, there is also mention made of the operation of gastrotomy per-

formed upon A. Grunheide, (*Bibl. de Planque*, t. I., p. 54,) for the purpose of extracting a knife which had entered his stomach through the mouth.

Quite a great number of cases of gastrotomy to remove a knife directly from the stomach, have now been related. M. Larrey (*Clin. Chir.*, t. II., p. 269-369) says that Grager had recourse to this operation in 1613, and that Frisac also at Toul employed it with success. Beckher (*Arch. Gén. de Méd.*, t. XV., p. 274,) who, in the seventeenth century, makes mention of a similar operation and Bernes, or Barnes (*Ibid.*) who, according to M. Marion (*Thès.*, No. 294, Paris, 1831,) had occasion for it,—do they refer to the same fact, or did each one have a case of gastrotomy? What prevents our rejecting such examples as manifestly apocryphal, is the fact that they are occasionally, in our own time, recurring in such a way as to dispel every kind of doubt. Caiyroche (*Bull. de la Fac. de Méd.*, t. VI., p. 451) gives a case of gastrotomy successfully performed upon a lady, who, for a long time previous, had had a fork in her stomach, and Valentin (*Ibid.*, 1807) relates a similar case of a silver spoon. At Paris, in fact, A. Dubois (*Ibid.*, t. VI., p. 517) was seen to take from an abscess in the iliac fossa, the blade of a knife which the patient had swallowed a long time previous. A misanthrope made an attempt upon his life and did not succeed; he then swallowed a tea-spoon. Nine months after, a tumor, which suppurated, appeared at the epigastrium. M. Otto (*Bull. de Therapeut.*, t. XV., p. 320) perceived it, and through this exit removed the foreign body, which was yet but little changed. The cure took place rapidly. [See notes under Special Operations, *infra*. T.]

[Instances of a similar character of swallowing jackknives, table and pocket-knives, bits of broken wine-glasses and tumblers, which had been first chewed up in the mouth; also of brass buttons, &c., have been very frequent in the United States for the last half century. These feats have been usually performed by reckless and intemperate persons, in high as well as low life, on banters, bets, &c. In some cases they have proved fatal, in others they have passed off, per anum, harmlessly, or after having caused considerable visceral disturbance. The jugglers of Hindostan, some of whom have exhibited in America, fearlessly insert, and that several times daily, a smooth narrow sword of one to two feet in length and near an inch broad, through the mouth and œsophagus, as far down as to the pyloric orifice, without the slightest injury to the parts. T.]

#### § IV.—The Urinary Passages.

The emigrations of foreign bodies, which have been introduced through the digestive passages, have at every epoch attracted the attention of observers. A woman, tormented with attacks of colic, was not cured, according to Van der Wiel, until after she had discharged through the urinary passages a ball she had swallowed. Among the examples of calculi of the bladder, which have exhibited for their nucleus, a pin, needle, point of a spindle, ear of wheat, ball, &c., it is probable that many of these reached there by this emigrating process. These substances having arrived in the stomach or intestines, get entangled in some of the folds of the mucous mem-

brane, and gradually escaping outside of them, continue to march in this or that direction, according to the disposition of the parts. Pins, needles, and very slender bodies, may in this way course to long distances without giving rise to symptoms of inflammation. Thus an infinity of cases are related where needles, which had previously been swallowed, had finally made their appearance under the skin. Should such bodies, in traversing through the cellular partitions and layers, ultimately reach the bladder, they might, as will be readily conceived, become there the nucleus of a calculus. Might it not be possible, also, that in becoming arrested in the ureter, after having pierced through the intestine, they would descend without difficulty into the reservoir of the urine? And could we not, in this manner, explain how worms, nuts, kernels of fruit, and beans, have been expelled through the urine? In the case of the soldier, mentioned in the *Journal of France*, (*Bibl. de Planque*, t. I., p. 48,) and who had a pin in the ureter; would he not, at a later period, have been affected with a calculus? A man about 30 years of age came into the Hospital of La Pitié, for a considerable contraction of the rectum. At the opening of the dead body we found in the pelvis a sub-peritoneal induration, which almost completely closed the rectum. A purulent passage extended beyond this as far nearly as the liver. A calculus of the dimensions of an inch, with a pin for its nucleus, was found between the ureter and ascending colon, at two inches below the kidney. The pin was situated in such way that its head still projected into the intestine, while its point was directed into the ureter. Is not this one of the cases, where nature leaves herself in some sort, to be guided by the state of the circumstances (*prendre sur le fait*)? Does not all this show, that but for the lithic concretion, the pin, escaped from the intestine, would have ultimately descended into the bladder.

#### § V.—Operation.

It is unnecessary to remark, that the presence of such foreign bodies does not in itself call for any surgical operation, so long as they do not, by any special manifestation, show themselves externally. When, therefore, they have been swallowed, we must confine ourselves to the conservative treatment of the organism, and wait until they make their way out themselves, or indicate their presence upon the exterior of the body by some particular symptoms. Under these circumstances, whether an abscess is established, or by the touch we distinguish the projection of the foreign body, we must no longer hesitate, but extract it as soon as possible. The rules to follow in such instances are subordinate to the particular circumstances of each case. Thus, should there be an abscess, it is to be opened freely, in order to give exit to the pus, after which, by means of a forceps, we seize hold of the foreign body to be extracted, and take it away with caution. Should the skin be sound, we first incise it to the proper extent, after which, the foreign body having been secured, we should proceed to the required dilatation and enlargement of the track which is to serve for its passage. As the outer surface of the stomach or of the intestines will almost necessarily have contracted adhesions with the corresponding portion of the



abdominal wall, we may enlarge the perforation of these organs without necessarily opening into the peritoneal cavity. Nevertheless, these adhesions being sometimes irregular or very circumscribed, there would be danger in enlarging too liberally in one direction, and an indication presented of having recourse to multiplied incisions. It is, moreover, a remarkable fact, that after these operations the wounds generally close up quite rapidly, even after the digestive cavities have been largely laid open. Experience having established that the cure is not so prompt and certain where ulceration exists as where the organs are merely divided, it is evidently much better to operate in good season than to wait for the tedious processes of nature.

## ARTICLE II.—THE LIMBS.

Foreign bodies when introduced into the limbs, are more easily recognized than in the splanchnic cavities. They act, however, nearly in the same manner, except that they do not travel there by the intervention of the natural canals. It is easy to conceive, however, that small grains of lead or other bodies of small size, might possibly after entering a vein be transported to the heart, and give rise to the suspicion of a lesion of an entirely different nature. This fact, indeed, might involve legal consequences sufficiently serious to justify the mention I have made of it. An inhabitant of Vannes having been engaged in a duel, received the discharge of a pistol in his neck. Repeated hemorrhage and various accidents took place, and death followed on the sixteenth day. The opening of the dead body demonstrated that the carotid artery had been opened, that the ball had entered into the jugular vein where it still remained, that it had formed here a varicose aneurism, and that but for a slight contraction in the vein, the projectile would evidently have fallen into the heart. I have seen the specimen and can guarantee that all that has been said in relation to this case by M. Jorret is perfectly correct. Surgery however could have nothing to do with the extraction of such bodies, unless they had become introduced into the superficial vessels. As to foreign bodies resulting from mortification and necrosis of the bones or soft parts, I have treated of them at sufficient length under the chapter on exsections, to make it unnecessary to recur to them now. There remain then the foreign bodies which have come directly from without, and those which may have come from a distance through the cellular tracks, (*trainées*.)

### § I.

Under these we have *needles* and *pins*. A pin having a head, does not generally go deeper than the level of the skin, and may be extracted without difficulty in almost all cases. It is no longer the same with pins without heads and with needles. Frequently we see these lost in the tissues, while they allow the wound by which they entered to be cicatrized, and cannot be found again without difficulty. A young man sat down upon the point of a needle and pricked himself severely; his master being alarmed, sent for me two hours after. Finding neither a puncture nor the slightest ap-

pearance of a foreign body on the point of the breech indicated by the patient, I supposed he had been deceived, and that the needle had been lost in the chamber. At the expiration of eight days, something sharp-pointed was perceived underneath the skin upon the outer side of the thigh, and which I laid bare with a cut of the lancet; it was the point of the needle, which then became easy of extraction. A boy eight years of age broke a needle in his calf. He himself insisted that there was nothing left in the leg; his mother, on the contrary, was convinced that every thing except the eye of the needle had become hidden in the flesh of her child. By dint of searching, I was enabled to discover at the distance of two inches from the puncture a hard point, pressure made upon which caused pain. Having laid open the skin at this place, I found the needle there lying naked, and that it was an inch in length. It would be difficult for me to say how many times the same thing has happened to me in respect to the fingers, palms of the hand, fore-arm, arm, shoulder, foot, body of the leg, thigh and breech. Even the face and cranium are not exempt from similar occurrences. When we are called therefore to such wounds, two cases may present themselves: either by means of a well-conducted exploration we establish the presence of the foreign body in the tissues, and then it is important to extract it forthwith; or in spite of our most minute researches we find or recognize nothing, and here prudence suggests that we should wait and watch the wound, and that we should be prepared for any event, without affirming that there is nothing there, but also without having recourse to any expedient or any inconsiderate operation. [See notes on Special Operations, inf. T.]

## § II.

After needles, fragments of glass are those which, having been introduced under the skin, most frequently remain there without producing inflammatory symptoms, while at the same time allowing the external wound to close over them. An adult man retained for the space of fifteen months, under the integuments of the forehead above the eyebrow, a triangular plate of glass nineteen lines in length and eight lines in width at its base. For a long time concealed by a cicatrix, this foreign body ultimately showed itself externally and projected at two or three lines above the eye, but without ever having produced the least degree of inflammation, or any other result than a slight degree of inconvenience in the movements of the eyebrow and forehead. After having moderately enlarged the wound, I extracted the body, which proved to be a fragment of a pane of glass. In the thigh I have seen fragments infinitely larger. A laborer, aged 25 years, was thrown from the basement story through a window, and by this means received a wound in the left thigh, for which he was taken to the hospital of La Pitié. I found the wound an inch and a half long, and upon the outer side and near the middle of the limb. I removed from it three pieces of glass, respectively of an inch, half an inch, and some lines in length. Every thing went on well until the eighteenth day, when, in pressing slightly upon the thigh of the patient, I perceived that he felt, in the neighborhood of the femoral vessels, a considerable deal

of pain, which was augmented on the least movement of the muscles. An incision there enabled me to extract from it a portion of glass *five inches* in length by about fifteen lines in breadth, together with some other small fragments of the same substance. Some dilations afterwards became necessary, and the patient recovered. Another young man had retained in this way, for the space of seventeen days, an irregular portion of glass of an inch in diameter, and without experiencing any other inconvenience than some pricking when he was obliged to walk. The wound being cicatrized, I made an incision of two inches externally, and where this fragment had arrived, and this slight operation was followed by nothing unpleasant. The palmar surface of the fingers and the plantar surface of the foot, are frequently the seat of similar wounds. I have removed a fragment of glass more than an inch long, and three lines in breadth, which had existed in the fold of the arm for the space of seven months. A young distiller who had broken a liquor phial in his hand fifteen months before, though cured of his wounds, had never ceased to be entirely without pain. An incision of an inch in length upon the point originally wounded, enabled me, after some researches, to reach and extract a triangular fragment of glass of from five to six lines in length. I was obliged to perform the same operation, occurring from a similar accident, on a young chemist then employed at the hospital of La Pitié.

A man had, for the space of thirteen months, at the root of the thenar eminence, an imperfect cicatrix resulting from a wound caused by a piece of broken bottle. As this man scarcely suffered any and did not mistrust that any thing remained in the hand, he continued at his labors, only occasionally asking some surgical advice of the surgeons of the three or four towns where he had been. Suspecting that there was some foreign body there, I made an incision in the track of the ancient wound. The probe having confirmed me in my first idea, I enlarged the incision and succeeded in extracting a fragment of glass fourteen lines in length by two in diameter in its smallest dimensions. To explain how fragments of glass, though angular, irregular and cutting in their edges, should thus be enabled to remain in so many instances in the midst of the living tissues, without producing any reaction, is a matter of very great difficulty. All that we can say is that they are insusceptible of chemical action, or enlargement or diminution, and that being devoid of inequalities, (rugosités,) the glass is restricted in its action to the mechanical or physical disturbance of the parts, without irritating them or altering them in any manner whatever. As for the rest, whether it admits of explanation or not, the fact is nevertheless as stated, and as experience has a thousand times demonstrated, which makes it proper that it should be so received in practical surgery.

### § III.

Glass, moreover, is not the only substance which sometimes acts in this way in the midst of the organs. I have seen in the midst of delicate tissues large sized and long pieces of *wood*, which caused no more disturbance than bits of glass. An adult man had been



wounded in breaking a box of black wood eighteen months before. The wound, which was between the thumb and forefinger of the left hand, soon healed. Nevertheless it reopened from time to time, and the patient suffered a little at the thenar eminence. I removed from it a piece of wood of eleven lines in length and two lines in its other diameters, resembling a nail or peg, and which had been driven in from before backwards, from the commissure of the thumb to the root of the first bone of the metacarpus, between the muscles in that region. A man employed in the service of Count Demidoff, came to the hospital of La Charité, in consequence, he said, of an abrasion which he had received from the point of a nail in breaking open the cover of a box.

The injury had occurred fifteen days before, and there was no longer any wound; but a phlegmonous erysipelas had appeared upon the fingers and almost the entire hand. Having made some incisions to give greater freedom for the escape of the pus, the parts were speedily disgorged, and the patient believed that he would soon recover. Having returned to his labors the inflammation reappeared, and he came back to the hospital at the expiration of a month and a half. Finding a spot on the anterior surface of the metacarpal bone of the middle finger more sensitive than the others, I made there a deep incision. Surprised to find the point of my bistoury arrested as if it had struck into wood, I examined the bottom of the wound, and found there a foreign body, which I immediately extracted with a strong artery forceps. What was not our astonishment in finding that this was a pliant fragment of wood fifteen lines in length! This patient, who had still some other particles of wood remaining in the hand, was ultimately cured of his wounds and inflammation; but the adhesion which took place among the different tissues and the tendons, and especially their synovial sheaths, left a stiffness and numbness in the fingers, which he will probably never get rid of. Bagieu (*Examen de plus part. de la Chir.*, etc., p. 103,) speaks of a splinter of wood 26 lines long and 8 in breadth, which had remained for two years underneath the skin below and outside of the knee, without any body having ever suspected it. A dragoon treated by Thomassin, (*Extract. des corps étrang.*, &c., p. 10,) had for the space of three weeks, without knowing it, a piece of wood in the skin 24 lines long. In the year 1838, I saw at the hospital of La Charité a man who had under the skin upon his legs a great number of indolent tubercles, which had been there twenty-five years, and which had been produced there in consequence of the explosion of a mine. Desirous of ascertaining if they were in reality foreign substances, I removed one of them which had caused considerable pain, and which was of the size of a small nut, and was situated above the internal malleolus of the left leg. This foreign body I found to be an irregular fragment of iron, which had become incorporated (*combiné*) as it were with the surrounding cellular tissue. A few days later, having removed a second fragment, I found that this was a portion of brownish earth, dried very hard, and also combined with the living tissues; while other portions were of the melted metal (*la fonte*) or *silex*. Quite a long fragment of bone driven in by the powder, was also found in the tissues.

§ IV.—*Balls,*

More perhaps than any other foreign body, may form for themselves a lodgment, and thus establish themselves in the living organs, and remain there for an indefinite period of time, without the patient's being aware of it. There are in fact some cases of this kind, where they are found at a great distance from their place of entrance. In the case of the Prince of Rohan they had ascended along the course of the tibia, and in that of Saint Mars (Dionis, *Operat.*, p. 818,) along the femur; in a child which recovered, two balls which had entered at the thigh ascended as high up as into the belly, (Blégné, *Jour. de Méd.*, t. IV., p. 78.) M. Dujaric Lasserre (*Cas de Chir.*, etc., p. 23, 1830,) in extirpating a tumor which a patient had had for a long time upon the sternum, was greatly astonished to find two balls in its centre. In the bones balls have often been found which had remained there from ten to fifteen and twenty years, without giving rise to any particular symptom. An ancient soldier who, in consequence of a gun-shot wound received twenty-five years before, had a necrosis at the lower third of the femur, with an ulcer, which from that date had opened and closed a great number of times, ultimately died of pulmonary phthisis at the hospital of La Charité in 1836. The examination of the limb in the dead body of this patient, enabled us to ascertain that he had a ball in his ham, which had worked itself a perfectly smooth and regular cavity upon the posterior border of the articular interstice. It has been laid down, therefore, as a precept from these facts, to make no dilatation (*débridement*) or any serious operation whatever, for the purpose of discovering either balls, shot, or any other foreign body whatever, so long as we have not ascertained to a degree amounting almost to certainty, the place where they have been arrested. When, however, we have ascertained in addition, that they are retained in the midst of the tissues, we may proceed in opposition to this precept, if there is no important organ that might be wounded, or if the operations deemed necessary, should in themselves present no difficulty or danger. A fragment from a grenade, as large as the hand, was extracted from the breech of an officer by Dionis, (*Op.*, D. X., p. 812.) Ravaton (*Chir. d'Armée*, p. 210,) and Bagieu (*Examen*, &c., p. 78.) have removed biscayans of from nine to twelve ounces in weight, and which had remained a long time in the tissues, causing there all sorts of disturbance. A ball imbedded in the instep, at the bottom of an abscess, was left there at the desire of the patient, and did not, it is true, prevent the wound from consolidating; but a fistula in the thigh did not close up until after Deschamps (Thomassin, p. 28,) had effected the extraction of a ball which rested upon the femur; a ball which had passed through the knee, and which was left in the ham, made it necessary to amputate, and caused the death of the patient, (*Journ. de Méd. Milit.*, t. XIV., p. 535.) Another ball on the contrary, retained between the patella and femur, after having traversed the knee from behind forwards, was extracted with entire success by Desport, (*Plaies d'Armes à feu*, p. 242.) Morand (*Opusc. de Chir.*, 2e partie, p. 252,) and Thomassin (*op. cit.*, p. 100,) have obtained similar successes in making use of the seton.

## ARTICLE III.—OPERATIVE PROCESS.

Operations required for the extraction of foreign bodies must necessarily vary from an infinity of circumstances. In most cases, the fingers, the dressing or the artery forceps, or the end of a spatula, or extremity of a probe, or the polypus forceps properly managed, will answer the purpose. But it is proper to add, that in certain cases we require instruments and operations that are more complicated.

§ I.—*Foreign Bodies retained in the Skin.*

It is rare to find any other matters implanted in the dermis except grains of powder, small shot, sand, pieces of earth or mortar. Supposing that it should be desirable to extract them, we should proceed best in doing so with the point of a pin, an ordinary needle, or a lancet, or cataract needle. It would be then necessary to scrape carefully, and as perfectly as possible, each little cup or spot on the skin with the instrument, if we desire to prevent all subsequent abnormal discoloration.

## § II.

Rugose or irregular bodies concealed underneath the skin or in the depths of the parts, require that we should first lay them bare by means of incisions of sufficient length. After that, it is advisable to seize hold of them with an erigne the same as for a tumor, and to remove by excision the cellular tissue, which it seems in most instances has become incorporated with them. Pieces of wood, scales of bone, portions of clothing, and inert concretions that have come from without, especially belong to this category. Fragments of glass, pins, needles, and all metallic bodies somewhat regular in shape, also require for their extraction an enlargement of the wound by which they entered, or that we should cut down to them in a proper manner by new incisions. As they contract no adhesions with the natural tissues, these foreign bodies should then be seized and extracted either by means of the fingers or the forceps. Being also sometimes very brittle, they moreover exact that the tractions made upon them should be managed skilfully and prudently.

## § III.

The enumeration which I have made farther back, shows that certain foreign bodies partially show themselves outside in the form of stems or plates. Thus a needle, pin, splinter of wood, or fragment of glass, the blade of a knife or sword, or a foil or ramrod, may be plunged to a greater or less depth into the tissues, while at the same projecting outside to the extent of some lines or inches. In such cases, the hand or fingers are the first instruments to be had recourse to, and they almost always suffice when the foreign body has traversed only the soft parts, and offers a sufficient purchase outside. Next to the fingers come the dressing or the artery forceps, and



lastly the blacksmith's nippers. [See under *Trephining*, Vol. II., the fortunate application of this last power in the case I have above alluded to. T.] If the foreign body has been implanted in bone, it is possible that the tractions made in this way may not be sufficient. It is in such cases that the nippers called *tricoises* in veterinary surgery, may become of great utility. Seizing the projecting portion of the foreign body, near the tissues, in the manner of a cutting pliers and without incurring the risk of too readily breaking it, they furnish the operator with an extreme degree of force. If a solid plate of wood or metal were placed on the skin around the projecting stem, the nippers would thus be furnished with a point d'appui, by which we would be enabled to succeed with them much better, and without causing so much concussion upon the organs of the patient. If by chance the surrounding body should project into some natural cavity, as in the pleura, as was seen in the case of Gérard, or the mouth, nose, vagina or rectum, it might be advantageous while making traction outside, to apply on its point a finger, armed with a thimble, so as to push it forward at the same time. This is what Gérard states that he did, and what M. Champion has also sometimes had recourse to, with the precaution of placing upon his thumb only a few transverse grooves. It is readily perceived, however, that for the mouth, vagina and rectum, the cavity of a small scoop, or small spoon, would answer full as well, and be more convenient than a thimble. The instrument of M. Charrière would become important and should be preferred where the resistance to be overcome appeared to be very considerable, and where it would be requisite to avoid all concussion in withdrawing the blade or metallic rod which had passed through the bones.

#### § IV.

Another circumstance still may present itself; it is when the foreign body implanted in the bones does not furnish a purchase either without or within the part. Then it becomes necessary to apply the *trephine* by embracing the projectile in the crown of the instrument, or we may employ the chisel, gouge, and mallet, in order to chip out at the same time the portions of bone which confine it, or at least to liberate its periphery, and enable us to seize hold of it with some kind of instrument. If the bone were not large or important, it might then be allowable to divide it on the two sides of the wound, and exsect it entire by means of any description of osteotome.

#### § V.—*Ball*.

No foreign body, in relation to the means to be employed for their extraction, has more particularly occupied the attention of surgeons, than balls. Every body knows the species of forceps called the *ball-extractor* (*tire-balle*) of *Alphonse Ferri*, and from whence have been derived almost all the litholabes of our days. The spoon-bill, the elevator, formerly so much used, and the tribulcon devised by Percy, have been introduced into surgery almost exclusively for this purpose; but the noose, (anserine,) concave and toothed forceps, the crow's-beak of Maggi, the cane-beak and stork's-bill, the instru-

ment of Ravaton, a mere improvement of that of Alphonse, the sheath-forceps of J. L. Petit, erroneously called Hunter's forceps, (Thomassin, p. 55,) the lizard's-beak, parrot-billed and claw-forceps, and the auger-forceps (tarières) mentioned by Guy de Chauliac, Paré and Fabricius ab Aquapendente, the crotchet, and an infinity of other instruments, which are figured or described in the authors I have named, are generally abandoned at the present time. We still find in Thomassin, (*Extract. des corps étrang.*, Strasbourg, 1788, pl. 1, fig. 3, 4, 5, 6, 7, 8,) the figures of three descriptions of forceps, of which one only, viz. that of the figure G, deserves to be retained. This is an instrument analogous to that of Ravaton, composed of two pieces, which are intended to glide upon each other in the manner of the pelvimeter. When opened it represents a lithotomy scoop. An effort is made to introduce it below the ball, which is then secured by forcing against it the other half of the instrument, which is straight and slightly pointed. It is rare, however, that extraction of balls cannot be effected by means of ordinary instruments or the polypus forceps. To favor the operation it is unnecessary to replace the patient in the position he had at the time of receiving the injury, unless the foreign body should appear to be less easily accessible by any other mode. Most usually it is advantageous to enlarge the opening by which the ball has entered, and consequently to make some incisions. If there should be but one opening, this is the one to be dilated. If, however, the ball should be found at a great distance, and that in order to fall directly upon it, it would only be necessary to divide a few layers that were neither very thick or important, we should not meddle with the first wound, but proceed to make a counter-opening. When once laid bare, we endeavor to force it out by enucleation, or by means of the finger, or a spatula, scoop, or spoon-bill. Supposing it should have existed a long time in the tissues, and had become enveloped in them, it would be better to remove its cyst with it than attempt to disengage it from that. I have stated, in speaking of balls introduced between the ribs, how we should, under such circumstances, proceed in removing them. It is scarcely but for balls that have become actually encrusted or imprisoned in the body of bones, that there can be a call for the trephine, or for some of the forms of exsection. Thus in the cranium, os calcis, olecranon, body of the tibia, condyles of the femur, and great trochanter, the extraction of the ball might require the division of the bone itself, and consequently become the occasion for the use of the trephine or for exsection. The most simple mode then is to include the ball within the crown of the trephine, so as to remove it with the osseous disc. If this process were not applicable, it would be necessary to apply the instrument to the neighborhood of the ball, in order that a chisel inserted in the hole might reach underneath the foreign body, and thus cause its expulsion. It is readily understood that by means of the chisel, gouge and mallet, we should succeed equally well in bones of a certain size, those of the limbs, for example, but that there would be some danger in making use of those instruments to the cranium. If the trephine should not appear to be very suitable, it would still be practicable to have recourse to the concave rowels of M. Martin, or the osteotome of M. Heine or M. Charrière, after

the rules laid down in the chapter on *Exsections*. It is moreover well understood, that during these operations we ought, by all the means known, put ourselves on our guard against wounding the vessels, nerves, tendons, articulations, and in fact all the important organs; and that, whether at the moment of the operation or afterwards, we should prepare ourselves against every kind of danger or accident that might occur, the same as we would for any other operation of a somewhat serious character.

#### ARTICLE IV.—FOREIGN BODIES IN THE ARTICULATIONS.

Among the foreign bodies which become established in the centre itself of the organs, I design to say one word only of those of the articulations. It is not of fragments of fungosities, fractured bones, diseased cartilages, or particles detached from the neighboring surfaces and become free in the joint, in consequence of a malady still existing, that I wish to speak upon the present occasion, but of those bodies known under the name of *free cartilages*, [loose] in the articulations; bodies of which I have pointed out the origin, symptoms and danger in another work; (*Dict. des Sc. Méd.*, 2e edit., t. IV., p. 179.) It is in the ginglymoid articulations that they have been most frequently encountered. Morgagni, according to Boyer, had seen many of them in the tibio-tarsal articulation. Haller states that he found *twenty* in the temporo-maxillary articulation. An elbow examined by M. Robert, contained eighteen or twenty; and M. Malgaigne states that he found nearly *sixty* in another humero-cubital articulation. It is in the knee, nevertheless, that they are almost exclusively found. Paré, Pechlin, Henkel, Simson, Hewitt, Ford, Bromfield, Théden and Desault are the authors who have more particularly drawn public attention to this subject. The size of these bodies is exceedingly variable. The one mentioned in the case of Pechlin was of the size of the finger, while that in the patient of Paré had the volume of an almond. I saw one removed from the knee, in 1822, which might have been taken for a flattened chestnut, [meaning the *marron* or large chestnuts of France, which are treble the size of our American chestnut. T.] A man admitted into the hospital of Saint Antoine in 1829, had one which was yet larger than that by one half. Sometimes, however, they scarcely exceed the size of a barley seed. When there is but one only, it is generally of large size; when numerous, on the contrary, they are almost always diminutive. Some are hard and, as it were, stony; others bear so strong a resemblance to fragments of cartilage that it is difficult at first to distinguish them from this last. M. Bourse, a physician in the environs of Paris, sent me one in 1834 for the Royal Academy of Medicine, which, to all appearance, was only a fragment of the external condyle of the tibia still invested with its cartilage. They have ordinarily less consistence, and may almost always be crushed under a certain degree of pressure. They contain neither vessels nor laminæ, and present no appearance of texture. Whether loose or not they have an unctuous aspect, which has made some suppose they had a synovial envelope. Their centre is usually the part that has least consistence, and desiccation considerably dimin-



ishes their dimensions. Being truly foreign bodies they are, in my opinion, simple concretions, whether fibrinous or lymphatic, or morbid sanguineous productions. These cartilages when they have once become smooth and unctuous, do not seem to be of a nature to disappear spontaneously. We can conceive only that they may become attached, engrafted or concealed in some region or some recess of the articulation, where they are sheltered from every kind of pressure and displacement for the future. It is thus that certain patients, after having been more or less tormented by them, have suffered no more and believed themselves cured. Other persons, again, are so little incommoded by them, that they scarcely think of them. A young lady of Arras, who consulted me in 1832, had had one in the knee for ten years, and suffered only when through accident she hit it against some other body. I saw in 1830, at the hospital of Saint Antoine, a man of from fifty to sixty years of age who had never been troubled by one that he had had in the knee for more than twenty years. But the great majority of patients unfortunately have not the same good luck. Besides the pain that the least unsteady movement may re-excite, they have, moreover, to fear in the sequel that the joint may become altered, as in the patient of M. Knox, or that it may become attacked by either acute or chronic inflammation; whence comes the necessity of considering the operations that possess the power of effecting a cure. Various means have been proposed for this purpose. Extirpation is the first which has presented itself to the minds of practitioners; but experience having soon demonstrated its dangers, it has been necessary to devise others. Compression in fact is the only resource that can be advantageously substituted for it in certain cases. Whether by fixing the body at a determinate point external to the articulating surfaces, it places it out of the possibility of being injured, or whether it acts by promoting its solution and absorption, certain it is that many patients have experienced great relief from it. Middleton obtained undoubted successes from it. Gooch also says he has had much reason to be satisfied with it. The same is remarked by Hey, who gives many examples, and who made use of a laced knee-cap (*genouillère*). Boyer in two or three cases was equally fortunate. When we have decided upon making use of it, it is important above all, to compel the cartilage to recede into a pouch (*cul de sac*) of the capsule, on the sides of or above the patella, for example, if it is in the knee, in order that by fixing it there we may maintain it there firmly, without having need of any very great degree of constriction. The bandage or knee-cap, moreover, should be disposed in such manner, that the patient may not be impeded in walking. We would not have recourse to absolute rest, nor an apparatus for preventing any movement in the joint, unless the first method had been used for a long time and failed. Its use, moreover, is very inconvenient; the more so inasmuch as it acts at first only as a palliative, and that it is often necessary to continue it for a number of years before a radical cure is effected. Also, it frequently fails entirely. Raymarus had seen its inefficacy in the hospitals of London.

M. Averill has given the case of a patient in whom M. Ballingall

had used it without any advantage, and a great number of practitioners have related similar failures. Their extraction is an operation so simple and easy in appearance, and so prompt, that it seems astonishing at first that compression should be preferred to it; but the surprise ceases the moment we reflect that it exposes to the same dangers as wounds penetrating into the articulations. A patient operated upon by Hewitt, and whose case is given by Raymarus, died in consequence of it. That of Simpson created the greatest degree of anxiety for several months. M. S. Cooper cites two other cases that perished from this cause. An example also is given in the cases of M. Kirby, which is calculated to inspire serious apprehensions. A young girl, whom I saw operated upon in 1822, was seized with symptoms so formidable, that her recovery attended with an ankylosis seemed in some degree to be miraculous. M. Richerand states that out of twelve operated upon by him, four died; two mentioned by M. Decaisne (*Encyclogr. des Sc. Méd.—Bulletin Belge*, 1836, p. 102) also succumbed. Bell, on the strength of facts of this kind to which he had been witness, goes so far in such instances as to express a preference for amputation of the leg, unless the cartilage should appear to be very superficial. David, cited by M. Ledo, confines himself to an ankylosis which he recommends should be artificially produced. Bromfield, Cruikshank and Boyer express nearly the same apprehensions. It nevertheless appears to me that the danger of this operation has been exaggerated. Ford, Hunter and Desault have performed it sufficiently often without its being followed by any unpleasant results.

Numerous cases of a successful issue have been collected in the theses of M. Champigny and M. Ledo. M. Larrey, J. Clarck, M. J. Coley, M. Brodie, M. Allan, MM. Muller, Soender and a multitude of others have also furnished similar examples. Aumont (*Archiv. Gén. de Méd.*, t. II., pp. 412, 472,) removed four of these bodies at two different occasions, with an interval of forty days, without causing the least accident. Most frequently, in fact, the cure is exceedingly prompt; and many patients have had it in their power to walk and resume their usual occupations at the expiration of six or eight days. So great a difference in the results is however readily explained. If it is possible to obtain immediate reunion of the wound and no inflammation take place under it, the whole matter is reduced to one of the most simple solutions of continuity. On the contrary, as soon as inflammation attacks the synovial and the interior of the joint, there is every thing to apprehend, and the danger of the disease cannot be dissembled. We should not therefore operate until after having duly weighed all these different circumstances, and forewarned the patient or some of his friends of the risks to which he will be exposed. The following is the rule which prudence, in my opinion, prescribes in such cases. So long as the cartilage produces but slight inconvenience we should endeavor to persuade the patient to support it; if it really causes disturbance in the functions of the joint, compression is then indicated. When it does not yield to the bandaging, or that the dressings used cause too much inconvenience, it is then time to think of its extraction. We should not however decide upon this step when the cartilage is concealed deep

within the joint or too difficult to be reached from without, unless it shall have produced unpleasant accidents, and after having in vain made trial of the other means. In such cases then when the cartilage, on the other hand, is very much diseased, and that it may be easily fixed without the articular interline and near the skin, the operation has every prospect of success. Many surgeons apprehending the introduction of air into the capsule, have suggested that we cannot take too much precaution on this point. Also to prevent the parallelism of the wound of the synovial and that of the integuments, they have carefully endeavored to draw the skin sometimes upwards, after Bell, at other times downwards, according to Bromfield, and in some instances to the side, as recommended by Desault and Abernethy.

What I have said of the action of the air, in speaking of articular wounds, (*Dict. de Méd.*, art. *Articulation*—see also M. Velpeau's opinions and those of other surgeons on this matter in our abridged account of the *Discussion on Tenotomy*, at Paris, in our notes of Vol. I. of this work,) renders it unnecessary for me to discuss here the value of these precautions. The only precaution which really deserves to be retained, is that which consists in conducting the body to be extracted as far as possible from the centre of the articulation, and to a point where there is the least amount of important parts to be divided. Being once brought there, it is firmly held between two of the fingers, or better still, as recommended by M. Averill, by means of a metallic ring, so as to stretch the skin uniformly, as advised by Simson, Theden, Vielle, &c., and in order that it may not escape under the action of the instrument and re-enter the capsule we have just opened. As for the rest, the most rapid and neat incision is evidently the best. For example, it is advisable to make it fall perpendicularly upon the foreign body, and to give to it at once an extent proportioned to the size of the morbid concretion. If the cartilage does not emerge by pressure in the manner of a kernel out of its fruit, we immediately seize it with a forceps, hook or erigne, and with one cut of the scissors divide the pedicle if it has any. The wound being brought together with adhesive plaster, the most perfect repose is recommended up to the time of its complete cicatrization. We might also, for greater security, apply to the whole of the joint exact but moderate compression, and keep the dressings wet with cold water during four or five days. As the accidents, after all, which may supervene, belong to arthritis complicated with wounds, we have no need of occupying ourselves with them any further. I will only call to mind that the disease is very liable to return, and that we must take care not to pronounce too sanguinely on this point.



## TITLE FOURTH.

## SPECIAL OPERATIONS.

## PART FIRST.

## OPERATIONS WHICH ARE PERFORMED ON THE HEAD.

## CHAPTER I.

## THE CRANIUM.

## ARTICLE I.—FUNGIOUS TUMORS.

DEGENERESCENCES of the dura mater almost always exhibit themselves under the form of tumors. These tumors, united under the title of fungous tumors since the time of Louis, are nevertheless sufficiently varied in their nature; there have, moreover, been associated with them a certain number of bodies which are altogether independent of the dura mater. The case mentioned by Hébréard (*Bull. de la Fac.*, t. V.) was a species of cyst, filled with pultaceous matter, and lodged in the left middle lobe of the brain, and which had only subsequently invaded the dura mater. In the same way, also, certain cases related by Abernethy (*Surg. Obs.*, vol. II., p. 51, 54,) seem to belong to degenerations of the brain, rather than to those of the dura mater. The confusion in this respect is so great, that we find comprised under the same title, fibrous, scirrhus, and hematic tumors, encephaloid masses, and various vegetations and fungosities which project from underneath the integuments of the cranium, whether they have had their primitive seat in the dura mater, the substance of the bones, or in the brain itself.

§ I.—*Fibrous Tumors.*

Though rarely found there, masses of a purely fibrous character are, nevertheless, sometimes encountered in the cranium. M. Senn (Espinosa, *Thèse*, No. 129, Paris, 1825) appears to have met with an example. In that which was exhibited to the Academy of Medicine in 1825, (*Archiv. Gén. de Méd.*, t. XIII., p. 121,) the tumor was of the size of an egg, occupied the base of the cranium posteriorly and to the right, had depressed the corresponding lobes of the brain, and had not been revealed by any symptom during life. As these tumors do not appear to have been yet seen except on the outer surface of the dura mater, it would have been interesting to know if the fibrous productions noticed by M. Del Greco (*Arch. Gén.*, t. XXIII., p. 432) in the pterygo-maxillary fissure, or the nasal fossæ.

and by M. Rayer in the zygomatic fossa, in a woman who died at La Charité, in December, 1834, might not be classed in this category.

## § II.—*Hematic Tumors.*

The blood which has been effused into the diploe, or between the dura mater and the bones, between the dura mater and brain, or into the most superficial layers of the brain itself, may undergo various kinds of degeneration, and assume the form of tumors that might be denominated hematic. Some facts related by Abernethy come to the support of this supposition. In the case of a man 40 years of age, who had been struck violently by a stone, and who had in consequence thereof a species of cerebral hernia, the tumor was found to be similar to coagulated blood. (Abernethy, *Op. cit.*, vol. II., p. 51.) The same author speaks of a carpenter who was trephined for a depression of the parietal bone, and who, on the twelfth day from the operation, had a sort of cerebral hernia, the tumor in which case also appeared to have been formed from blood extravasated into the substance of the brain. From these facts, Abernethy moreover concludes, that what has been described under the name of cerebral hernia, is sometimes formed by blood, and that it is the same with certain fungous tumors of the dura mater. A fungus developed in the head of the tibia, and which he also compares to coagulated blood, also what I have said of contusions, and what I have often since remarked, (*Thèse sur les Contusions*, 1833,) serve but to corroborate this view of the subject. We could thus explain the appearance of tumors, which it seems difficult to range under cancers, and whose origin in reality appears to be ascribable to some external violence.

## § III.—*Phlegmasian (phlegmasiques) vegetations.*

Wounds of the head, fractures of the cranium and trephining have been frequently followed by fungosities and vegetations upon the dura mater, in such a way that Louis especially was led to confound these productions with true fungus. When they have been preceded by a protracted suppuration, and that the surface which supports them has become exposed to the air, it is difficult to say in what such fungosities differ from those which are so frequently found at the bottom of external wounds. In other cases, on the contrary, they probably result from some extravasation of concretible lymph, or from fibrine, and sometimes also from sanguineous morbid layers which have ultimately become organized. I have elsewhere (*Plaies de Tête*, 1834) published some facts of this kind. Perhaps also, the following case which I find in Abernethy, (*Op. cit.*, p. 106,) belongs to the same description. A man from thirty to forty years of age was afflicted with violent pains in the head, in consequence of a *severe salivation*; he was trephined and *pus was found under the bones*, and the dura mater, which was greatly thickened, was covered with a *soft and reddish substance*.

## § IV.—*Fungus.*

All, or nearly all the other tumors of the dura mater are cancers.

Almost all those that have been described, were evidently composed of encephaloid matter. The one which Paré (liv. XII., chap. 23) mistook for an aneurism, was formed from the *brain*. The patient mentioned by Rey (*Acad. de Chir.*, t. V., p. 22) had at the same time, a cancer in the thigh, or the *femur vegetated* (carnifié.) In that of Philippe, (*ib.*, p. 36,) the bones of the cranium were also vegetated (carnifiés.) In a case cited by M. Chelius, (*Arch. Gén. de Méd.*, t. XXVIII., p. 422,) the substance of the tumor resembled *marrow*; and how is it possible not to recognize a cerebriiform fungus in the encephaloid (venteuse) tumor, described at such length by Lecat, (*Soc. de Santé de Lyon*, 1798, p. 31)? The production was also of an encephaloid character in the two lunatics, noticed by M. Blandin, (Espinosa, *Thèse*, No. 129, Paris, 1825,) also in the case mentioned by M. Deneux, (*ib.*, p. 9,) the child eight years of age, spoken of by M. Marjolin, (*Dict. de Méd.*, 1e edit., t. IX., p. 305,) and in the case referred to by M. Bouvier, (*Bibl. Méd.*, 1825; or Espinosa, *Op. cit.* p. 10.) The tumor removed by M. A. Bérard (*Gaz. Méd.*, 1833, p. 735) was also an encephaloid mass; and in the patient of Siebold, (*Journ. Compl.*, t. XXXIV., p. 304,) and who died under the operation, it was a cavernous substance. Schindler also says (*ib.* p. 325) that cerebroid matter was found in a tumor of this kind in an aged woman, and M. Ebermayer (*Arch. Gén. de Méd.*, t. XXII., p. 229) states the same thing of a young girl aged four years. I could say the same thing of a lady seventy-one years of age, whom I saw with M. Durand, and also of a case communicated to me by A. Lauth. M. Cruveilhier also, who describes and has given the figures, (*Anat. Path.*, 8e livr.) six cases of fungous tumors of the dura mater, speaks only of encephaloid tissue. Scirrhus tissue, however, may also form its base. A woman, whose case I published in 1825, had two tumors of this last description, which I showed at the time to the Professors of the Faculty of medicine, and which I have for a long time preserved in alcohol. Whether encephaloidal or scirrhus, these tumors nevertheless differ in a remarkable manner, in respect to the parts of the membrane upon which they are situated. Out of fifty-one examples where this location was given, I found thirteen in the parietal regions, eight in the temporal, seven in the frontal, seven in the orbito-nasal, seven in the occiput, five in the vertex, three on the petrous bone, and one in the substance of the falx of the brain. I have, in two cases, seen them protrude from the ear, and once through the pharynx. All ages are liable to it. The following is the proportion in this respect, which was found in forty cases: From birth to ten years, six cases; from twenty to thirty, seven; from thirty to forty, ten; from forty to fifty, nine; from fifty to sixty, five; and from sixty to eighty, three cases: from whence it follows, as had been remarked by Boyer, (*Malad. Chir.*, t. V., p. 186,) that they are, notwithstanding, more frequent between the ages of thirty and fifty years, than at any other period of life. As to the sexes, I notice that in forty-four cases, twenty-three were men and twenty-one women. The legitimate *fungi* of the cranium are in their nature incurable. Those tumors which seemed to be formed by effused blood, like those examples given by Camérarius and Abernethy, (Ebermayer, *Journ. Compl.*, t. XXXIV., p. 301,) those which result from



syphilitic disease, and whose character is not decidedly cancerous, may alone leave some hope of cure. The prognosis for all the others, as has been remarked by Delpech, ought to be the same as for cancers of the most serious description. Moreover, these tumors sometimes are exceedingly slow in their progress. The patient of M. Graefe (*Arch. Gén.*, t. XVIII., p. 421) suffered for *thirty-seven years* and then died. The child mentioned by Schindler in the same way, lived over *five years*, (*Journ. Compl.*, t. XXXIV., p. 320.) Death did not take place until at the expiration of forty-five years, in the woman whom Robin (Louis, p. 18) caused to be exhumed five years subsequently; not until after thirty years in one of the patients of Voisin; (Thibault, *Thèse*, No. 133, Paris, 1816;) often ten years in another, and after fifteen years in a case extracted from the English Journals. (*Journ. Gén.*, Avril, 1814.) Also, it is less by hemorrhages, destruction of the tissues or extension of the degenerescence, that these tumors cause death, than by cerebral accidents which ultimately supervene.

In at least twenty cases out of fifty these accidents have been brought about by attempts at operations. These accidents consist of convulsions, delirium, symptoms of compression of the brain in fine, or of inflammation of the meninges. Sometimes also, as I have seen in the case of a woman, they are reduced to symptoms of debility, soon followed by hebetude, afterwards partial or general, or incomplete or complete paralysis, and a continual desire for repose or even for sleep. This state may be maintained for many months, gradually becoming aggravated. The patients then ordinarily expire without spasms, and so to speak, imperceptibly. In this last case death almost always happens by compression. Upon the opening of the dead body it is seen that the tumor has augmented in growth within, either in breadth or depth (*épaisseur*) so as to react with more or less degree of force upon the mass of the brain. If on the contrary the patients sink rapidly, we find the dura mater, or the surface of the brain inflamed and covered with pus, as though it were ulcerated or had undergone *ramollissement*, or been reduced to a state of putrilage (*putrilage*.) Small apoplectic cells (*épanchements apoplectiques*) are also sometimes remarked in the substance of the hemispheres themselves, and it is not unfrequent to find the purulent infiltration of the arachnoid extending itself as far as the occipital foramen and around the spinal marrow.

A. *Treatment*.—The disappearance of a fungus of the dura mater by resolution or suppuration has never been noticed; therefore, the plasters, pomades, unguents, and other topical applications proposed or made trial of, with a view of obtaining one or the other of these terminations, must be absolutely proscribed. Nor does the compression of the tumor appear to possess any more curative power; it is allowable only in the character of a palliative, and even then cannot be made use of but in a very small number of cases. The destruction of the fungus, whether by caustics, the ligature, or the knife, is in reality the only medication which merits consideration. Extirpation itself, the only remedy which reason sanctions the employment of, appears to have been but very rarely followed by success. In fact the external tumor is often only the smallest portion of the evil. After having removed it, we soon see it reproduced, if in fact new tu-

mors do not also appear. In this respect they have that feature in common with cancerous tumors in all other parts of the body. But not being enabled to make their way outwards, except through an osseous opening, it is not possible, as in the last, to designate their limits beforehand. I cannot perceive, however, why we should not attempt to extract them, when there is every reason to believe that they are clearly circumscribed, and that the disease is altogether local. In a woman who had been cured of cancer of the breast and who died of a pleurisy at the hospital of the School of Medicine in 1824, a scirrhous of the size of a small pullet's egg, commencing at the dura mater, had traversed the bottom of the right inferior occipital fossa, made a slight projection under the splenius muscle, and was found to be so regularly circumscribed, that it certainly would have been possible to have removed it entire, if its existence had been suspected during the life of the patient. The operation might be made trial of, at least for the fungous tumors of new-born infants, to which M. Nægelé has been one of the first to endeavor to draw the attention of practitioners, and also upon those which Abernethy derives from certain degenerated sanguineous or lymphatic concretions. Five out of the six cases in which caustics were employed perished. The individual mentioned by Cattier, (*Obs. de Méd.*, p. 48, obs. 15,) and who was treated by caustics against the advice of Pimpernelle, who advised the trephine, also died; it is also probable that that of M. Eck, (Ebermayer, *Jour. Compl.*, t. XXXIV., p. 323,) the only one which was cured, had only a simple hematic tumor. It is equally doubtful if M. Ficker, (*ib.*, p. 320,) had to do with cancer, in the case of partial success, which he relates, with the ligature. As to extirpation, it has not, up to the present time, produced but very uncertain results. Franco says, (*Tr. des Hernies*, p. 485, An 1561,) "I saw a child who had a fungus tumor which two of us wished to extract, (tirer.) Nevertheless I was somewhat deterred, [*je fus aucunement refrody*—ancient French, T.] perceiving that the cure appeared to be difficult and not what it seemed to be (non tant qu'elle l'estoit); at the expiration of some days, my companion alone undertook it, when he found it within the brain itself, which was followed by the death of the patient. It is therefore very necessary to reflect and to ascertain (taster) if the brain is or is not entire." A patient mentioned by Camérarius (*Ephém.*, c. n. dec. 2, obs. 99, an. 8) also died from this cause. Amatus, (Cent. 5, obs. 8,) Schmucker (*Bibl. Chir. du Nord*, p. 10,) and Rossi, (*Med. Op.*, t. II., p. 261,) relate similar instances. It is necessary also to concede that it has scarcely ever been successful. In one of the cases of M. Walther, (tom. XXXIV, p. 314,) he was prevented from finishing the operation by a hemorrhage which made it necessary to apply the ligature to ten arteries; in a case mentioned by Klein, puncture was had recourse to, and then an incision. M. Ebermayer, (*Archiv. Gén. de Méd.*, t. XXII., p. 229,) in the case of a child of four years, whose history he gives, mentions only a single cut of the lancet. Nor was there any other treatment than incisions made use of in the patient of Sivert, who nevertheless died two days after.

In the case of Rey, (Louis, p. 22,) the tumor was only laid bare without removing it. The patient of Courtavoz and Chopart, (*Mém. de l'Acad.*, t. V., p. 28,) died on the following day, though here

also incisions only were made use of. A similar attempt was followed by the same results in the case of Philippe, (*Ibid*, p. 36.) Nor was the excision complete in the case of Saltzmann, (*Ibid*, p. 30, or *Mém. de Saint Petersburg*, t. III., p. 275.) The same was the case in the patient of M. Graefe, (*Arch. Gén. de Méd.*, t. XVIII., p. 421;) which however did not prevent the wound from cicatrizing, nor life from being prolonged to the period of seven months. The same should be said of the new-born infant, mentioned by Schneider, (Ebermayer, *Journ. Compl.* t. XXXIV., p. 320,) since it became necessary to repeat the operation at the expiration of five years, at which time it proved fatal. Nor could Siebold in his case complete the extirpation of the tumor, for the patient died under his hands. In remarking that he removed all *that he could*, M. Orioli, (*Gaz. Méd.*, 1834, p. 410,) leaves it quite apparent that the disease had not been effectually destroyed in his patient, when gangrene came, so to speak, to complete his operation. Reasoning moreover, would have sufficed to demonstrate what experience has now placed beyond all doubt, to wit: that such attempts were calculated but to augment the danger of an evil, already so formidable and insidious in itself. Such facts, therefore, are not to be taken into the account, when we undertake to determine the value of the operation of extirpation for fungus of the cranium. The small number of cases where the operation has been effectually accomplished, furnish results somewhat less alarming. The Spaniard that M. A. Severin (*Journ. Compl.*, t. XXXIV., p. 300,) states that he cured, could have been so only by the trephine. The same must be said of the patient of Grosmann, (Stoltz, *Thèses de Haller*, 1708, presid. de Sand.) M. Eck says he succeeded without trephining; but he employed caustics after extirpation. I have already remarked that the success of M. Orioli was as much owing to the gangrene as to extirpation. M. Klein twice cured the same patient with an interval of a year, by means of the trephine and extirpation; but he believes the glands of Pacchioni were the seat of the fungus. In another patient the same operation was followed by death, (*Arch. Gén. de Méd.*, t. XXII., p. 225.) In the case related by Volprecht, (Louis, p. 31,) the trephine was applied around the tumor; but this last was not removed, and the autopsy showed that other fungi existed in the cranium. A meningitis caused the death of the patient that Dupuytren had operated upon, (Denonvilliers, *Thèse*, 1789, p. 76,) by embracing the whole tumor in a large crown of a trephine. The patient operated upon by M. Bérard, also it is true died, but it had been rendered necessary to apply sixteen crowns of the trephine, and to remove a portion of the longitudinal sinus. M. Pecchioli, in operating upon a man 46 years of age, (*Gaz. Méd.*, 1838, p. 414,) who had a fungous tumor to the right of the sinciput, succeeded perfectly by means of three crowns of the trephine, and by removing a portion of the dura mater. I perceive that M. Syne, (*Edinb. Med. and Surg. Journal*, vol. CXXXVII., p. 384,) going as far down as to the dura mater for a large fungous tumor of the cranium, cured his patient also. If it were proved that the tumor attacked was almost never solitary, these few successes perhaps would not be sufficient to justify the operation of which we are now speaking; but it is to-day demonstrated by the



patient of Pohlius, by that of M. Bérard and by many others, that fungus of the dura mater, like cancer of the breast, is at first quite frequently uncomplicated (unique); nor do I hesitate to say that extirpation is indicated at the cranium as in any other region, and that there it presents the same counter-indications as for other cancers. It must, however, be admitted, that in itself the ablation of deep-seated cancers of the cranium is infinitely more dangerous than in any other region of the body, and that these dangers, taken in connection with the unfortunate prognosis which naturally belongs to the disease, are calculated to make us exceedingly circumspect in such cases.

*B. Operative Process.*—If however it should be decided upon, it would be necessary, while taking care to cut the flaps in the sound parts, to preserve as much of the cranial teguments as possible. Crowns of the trephine should then be applied all around the tumor, and the intermediate osseous angles forthwith destroyed by a saw made expressly for this purpose (*ad hoc*), or by means of the chisel and leaden mallet. If the tumor should be situated in the bones only, the surgeon would remove it immediately without incising the dura mater. In the contrary case we should not hesitate to cut round the entire morbid growth, including moreover in the circle a sound margin of the dura mater. Having arrived at this stage of the operation, we ought even to penetrate still deeper if the tumor should be found to have its origin between the pia mater and the brain.

In cases of very large fungus, perhaps it would be advisable to perform the operation at two periods, at an interval of from twenty-four to forty-eight hours, to apply but half the crowns of the trephine on the first day, for example, as M. A. Bérard did, and not to complete the perforation of the bones until the day after, or the day after that, and immediately previous to the extirpation of the tumor. A woman recovered in this way after having sustained the application of *fifty-two* crowns of the trephine, for a large necrosis of the cranium, accompanied with caries, (Méhée de la Touche, *Plaies de la Tête*.) As it is not possible in such cases to unite the wound by first intention, a piece of linen spread with cerate, and perforated with holes, should be extended over the entire solution of continuity. Balls and then gateaux of lint should be applied over this, and kept in place by means of a suitable bandage, so as to fill up the void which has been made in the cranium, and make moderate pressure upon the brain. This last precaution is of the highest importance when we have been forced to excise the dura mater. The patient of M. Bérard, who during the operation had experienced no inconvenience in this respect, swooned away as soon as the tumor with its flap of membrane had been entirely extirpated, and did not come to until after the compression which they had the presence of mind immediately to make, at the place where the parts had just been detached. It cannot be denied also that the sudden abstraction of an abnormal pressure which may have been considerable in its amount, and existed in many cases for several years, must necessarily expose to serious accident in regard to the brain. Extirpation, therefore, of cancers of the cranium, in my opinion, presents but few chances of a favorable issue when the disease proceeds from the pia mater, or where we have to destroy only a somewhat extensive portion of the

dura mater. Consequently then it is for the tumors only with a narrow base, and for such as do not render it necessary to remove anything but the bones, that this operation is in reality admissible. The rest of the manual and its consequences, moreover, are too analogous to those of the trephine, to require that I should say any more on this subject in the present article.

## ARTICLE II.—ENCEPHALOCELE.

There is no resource for hernias of the cerebrum and cerebellum but that of making the patient wear a bandage furnished with an elastic pelote properly adjusted. Every kind of bloody operation would be dangerous and probably cause death, as in the case that Lallement has published, and in that of M. Baffos. Many surgeons, however, have ventured upon its excision. These excrescences from the brain, so frequent in traumatic phlegmasias, and those that follow openings into the cranium, and which M. Champion denominates *hypercephalose*, which Gall considers as the unfoldings of the convolutions, and upon which Langius has written very learnedly, (Epist. 6, liv. I.—Bonet, *Corps de Méd.*, t. III., p. 173.) are attributed by Arne-mann (*Gaz. Sal.*, 1787, No. 50, p. 2.) to the expansion of the anterior ventricle of the brain. It succeeded to a fracture in the case of Tulpius (Bonet, *Corps de Méd.*, t. IV., p. 37, obs. 54.) and in that of Las-sus (*Méd. Op.*, t. II., p. 273.) Diemberbroeck (*Anat.*, t. II., p. 235, liv. III., ch. 5.) speaks of one which detached itself several times, and which resulted in death. In the case of Tudecius (Planque, t. XXVII., p. 87.) the cause was the presence of a foreign body, viz., the blunt point of a halberd. In a case where the hypercephalose protruded through the opening made by the trephine, F. de Hilden (Bonet, t. II., p. 374.) states that Bourg had excised it with success. According to Henry Pætrus (Bonet, *Corps de Méd.*, t. IV., p. 49, obs. 73.) extirpation was also performed by Rhodius. The excision of a tumor of this kind, put a stop to the serious accidents it had occasioned in a case related by Trioen and Ravaton, (*Prat. Mod. de la Chir.*, t. I., p. 222, 225.) who advises that they should be extirpated as far forward as possible, (le plus avant possible,) and has often performed this operation without accidents: the pulse after it rose and the head became more free, [i. e. less or rather not at all oppressed any longer by the tumor, T.] Tétu (*Mém. de Méd. Chir. et Pharm. Milit.*, t. XIV., p. 33. et 39.) after having performed excision, had recourse to compression with success. Deidier (*Encyclop. Méth. Méd.*, p. 252, col. 2.) in a case excised many excrescences from an encephalocele without causing pain. It is nevertheless true, that apart from some rare exceptions, I should prefer with Rossi (*Elém. de Méd. Oper.*, t. II., p. 240.) to restrain these tumors by means of plates, or by any kind of compression whatever, rather than attack them with the cutting instrument.

## ARTICLE III.—MELICEROMA,\* (MELIÉCRIS.)

Many persons will carry during their whole life, under the hairy

\* [The Greek coinage of this word is we deem perfectly justifiable, to harmonize with steatoma, atheroma, lipoma, &c. T]

scalp, steatomatous, atheromatous, or meliceromatous tumors, without being sensibly inconvenienced by them or even attempting to do any thing to get rid of them. Others suffer more or less from them and for some reason or another desire at any hazard to be disembarassed of them.

The nature and formation of these *loupes*, still imperfectly understood, appear, in my opinion, to require further researches. There are some of them which, at their beginning, exhibit themselves under the aspect of a small, hard, yellowish, friable, unorganized mass, similar to collections of fibrine, or blood deprived of its coloring matter and serous portion. Increasing in growth, they begin by becoming soft at the centre, and are thus transformed into a cyst, which is so much the thicker in proportion as the tumor is less ancient or of less volume; a cyst which is filled with grumulous substances, in a greater or less state of fluidity, and which resemble neither pus nor fat. Should we not ascribe their origin to some of the elements of effused blood? It is at least certain that they are not distended cutaneous follicles, as is asserted by Béclard and M. A. Cooper. Their cyst, which is thicker in proportion to their less degree of development, is always independent of the skin. A tumor twice the size of the head, and which perhaps was only an atheromatous cyst, though the author describes it under the title of lipoma, was removed with perfect success by M. Pl. Portal, from the forehead of a child of four years of age, (*Clin. Chir.*, p. 279.) Sebaceous, serous and other kinds of cysts, lipomas and fibrous tumors, are to be treated at the cranium as in any other part of the body. I have seen sub-cutaneous encephaloid cancers in many individuals, an erectile conical tumor of an inch in length, with a thick pedicle, in a young Moldavian of twenty-four years of age, and melanotic plates of sufficient size in three or four cases. There might be cases where the ligature would suffice to detach them, as in a case related by Boyer, but it is rare they are strangulated at their base. M. Bertrand, (*Arch. Gén. de Méd.*, t. XX., p. 285,) states that he cured one by passing through it a *long needle*, which he kept there in the manner of a seton. Demours, who placed two needles crosswise instead of one, asserts that he thereby obtained successful results. But the cutting instrument here is infinitely better, and ought always to be preferred.

*Operative Process.*—When the tumor is of great size, and the skin much attenuated, an *elliptical flap* of integuments should be removed with the cyst. Two semilunar incisions are then first made. A transverse incision is then made from each lip of the wound, and prolonged outwardly, so as to circumscribe four flaps, which being raised up with care, enable us to remove the loupe entire and without difficulty. In most cases these two last incisions may be dispensed with. While the surgeon, with an erigne or good pair of forceps, draws on the cyst with one hand, he dissects with the other, by means of the point of the bistoury, its external surface, and thus readily succeeds in separating it from the surrounding tissues. In the ordinary process, and where it is unnecessary to sacrifice any part of the skin, it is recommended to make a simple *crucial* or T incision, and to take every possible precaution not to open into the cyst while dissecting the flaps of the wound, which latter is to be united by first intention,



after having extirpated the tumor. M. A. Cooper adopts another course. He first opens freely into the tumor, empties it by compressing it with the thumb and forefinger; then seizes the cyst on one side by the hook or forceps, and dissects and removes it. The incision being made in such manner as to leave intact the posterior wall of the meliceromatous pouch, M. J. Cloquet immediately seizes with a forceps its anterior wall under the right lip of the wound, draws upon it in proportion as he divides the adhesions, which are ordinarily very feeble, and thus effects, to some extent, by a single stroke, the enucleation of the whole cyst. I have, on more than one occasion, confined myself to dividing the integuments only, and then seizing the tumor at the bottom of the wound with a strong *ergine*, after which it becomes easy to dissect and remove it. By these three variations of the *process of simple incision*, the operation is much more prompt and less intricate than by the ordinary process. After the removal of the sac, the borders of the wound, so to speak, replace themselves in contact, and reunion is generally accomplished in the space of a few days. M. Tealier, (*Transact. Méd.*, t. II., p. 430,) who, after a simple incision, confines himself to making traction on the sac in order to extract it; M. Brachet, (*Ib.*, p. 371,) who removes this cyst after having slit it open and emptied it; and M. Chaillay, (*Ib.*, p. 431,) who lays it open and empties it, and then besmears it with red oxyde of mercury; and all which surgeons supposed they had imagined something new, were doubtless ignorant of what I have said above. *The process which I now adopt* by preference, is exceedingly simple; the youngest pupil may perform it with impunity. Having opened into the tumor by puncture with a bistoury or lancet, the same as for an abscess, I seize, with a good pair of artery forceps, one of the commissures of the cyst, which latter I remove by enucleation, separating it by means of the beak of a spatula, as M. Champion does, or by the myrtle-leaf, cataract scoop, the handle of a scalpel, or merely the nail of the little finger. The operation, therefore, is so easy and prompt, that I cannot see what would be the advantage in substituting for it the employment either of *potassa*, as proposed by M. Brachet, (*Ib.*, t. II., p. 371,) Guérin, or M. Canihac, (Rey, *Thèse*, No. 79, Paris, 1834, p. 91,) or the *Vienna caustic*, as eulogized by M. Hennau, (*Transact. Méd.*, t. II., p. 385,) and by M. R. Gérardin, (*Journal des Conn. Méd. Chir.*, 1837.) It is nevertheless true that, like every other operation, it sometimes gives rise to serious accidents. In a case cited by M. Merat, (*Transact. Méd.*, t. XI., p. 432,) it was followed by tetanus. A female patient, who was operated upon for it in 1825 at the hospital of the Faculty, was seized with an extremely dangerous erysipelas; and in another woman it caused her death. But these are very rare exceptions, which do not take place in one case out of fifty. The wound almost always heals in less than eight days. Left to itself, moreover, the tumor increases in size, and may be transformed into cancer. This is what took place in an old man I operated upon in 1836, and in a woman aged seventy years, whom I operated upon on the 12th of January, 1839. I have removed as many as eleven of these tumors at one sitting. Some patients also have their cranium as it were covered with them.

## ARTICLE IV.—HYDROCEPHALUS.

The principal operation which has been proposed for hydrocephalus is puncture of the cranium. Holbrock and Vose (Dugés, *Manuel d'Obstétrique*, &c.) profess to have performed it, or to have seen it performed with success. Rossi (*Médecine Opératoire*, t. II., p. 46.) has drawn in this manner, at several times, six pounds of serosity from the cranium of a child eleven to twelve years of age, and who got well. M. Syme, in 1826, had recourse to it five times on the same child, in the space of a few months, and each time with some apparent advantage, though the little patient ultimately perished. M. Greatwood (*The Lancet*, 1829, vol. II., p. 238,) succeeded with it in one case, and M. A. Cooper appears once to have obtained partial success from it. M. Bédor, (*Gaz. Méd.*, 1830, p. 188,) who has also made trial of it, likewise believes that it may answer. But the injury done to the brain by hydrocephalus, is ordinarily too deep-seated for a simple puncture in such cases to restore the health. Nevertheless, should it be decided upon, nothing is easier to do than this, either with the lancet, bistoury, or a small trochar. There would be no other precaution to take than to avoid with care the track of the venous sinuses. Upon the supposition that we did not wish to draw off at once the entire amount of the liquid, I would much prefer repeating the operation from time to time, rather than to leave a canula resting in the wound, as has been proposed by Lecat. As to the rest, it is an operation which now counts a great number of trials. Theodoric (Portal, *Hist. de l'Anat.*, etc., t. I., p. 185,) had already made the remark, that hydrocephalous children treated by the application of the red hot iron to the forehead or the occiput, had ultimately recovered. It appears also that S. Chabbi (Hévin, *Path. Chir.*, t. I., p. 232,) had performed it with success. Also in cases of this disease where it would seem to be required, other surgical means have been resorted to. Warner (*Obs. de Chir.*, obs. 11., p. 69,) says that in a case in which extirpation for a *hydrencephalocèle* was performed against his advice, it caused death; and Thiebaut (*Journ. de Desault*, t. III., p. 327,) gives the history of two similar attempts, which were followed by the same result. A case also operated upon in Scotland, and in which a *hydrencephalocèle* that projected above the nose was excised, terminated fatally. Leveillé (*Nouv. Doct. Chir.*, t. III., pp. 47, 48,) who relates this fact, says the same thing took place at Gottinguen. In the case of an infant aged seven months, in which the tumor, projecting through the parietal bone, was cut into by Rambaud, (*Journ. de Dehorne*, t. IV., p. 212,) death in fact followed on the day after the operation. The case of an infant mentioned by Sulpis, (Bonet, *Corps de Méd.*, t. IV., p. 6, obs. 7,) was no less unfortunate. I have seen, says M. Champion, two infants die, who were operated upon for this disease in spite of my advice to the contrary, one at the forehead, and the other near the occipital hole. The first died the day after the application of the ligature, which had been placed around the tumor; the other survived only some hours after the ligature had been applied, followed by excision of a *hydrencephalous* sac of considerable size.

Puncture of the cranium also for hydrocephalus was performed in France before the English surgeons had received it. Pelletan (Heurtault, *Consider. sur Diff. Points de Chir.*, p. 111, 1811,) had recourse to it at the Hotel-Dieu of Paris, the 7th Thermidor, and year VII, on an infant aged twenty-two months. A canula was left remaining in the parts, and the patient died at the expiration of five days. Besides the above examples, we might mention at the present time many other instances of puncture of the cranium in cases of hydrocephalus. Thus M. Graefe (*Arch. Gén. de Méd.*, t. XXVIII., p. 409,) and M. Russel (*Gaz. Méd.*, 1832, p. 641,) have each had a successful case. M. Hoefeling (*Encyclogz. des Sc. Méd.*, 1838, p. 251,) gives a case of hydrocephalus in a child aged five years, who having received a kick from a cow, had the cranium fractured and was thus cured of his disease. I will add that M. Allaire, (*Jour. des Conn. Méd. Chir.*, t. II., p. 305,) who drew by this operation, repeated three times in one month, six ounces of liquid at each of the two first punctures, and four at the last, had not the same success, as his patient died soon after. It is nevertheless true that the cases of M. Conquest (*Gaz. Méd.*, de Paris, 1838, p. 251,) are now sufficiently numerous to merit all the attention of practitioners. In his last table this practitioner relates *nineteen* cases of this operation performed by him during the last ten years. In the first of his cases, M. Conquest, who made but one puncture, drew off 32 ounces of liquid, and obtained complete success. The second underwent three punctures, which yielded thirty-four and a half ounces of serosity, but ultimately ended in death. The third recovered after two punctures and the evacuation of twenty-four ounces of liquid.

In the fourth, death occurred after the fifth puncture and the removal of  $48\frac{1}{2}$  ounces of fluid (de matière.) The fifth died also after four punctures, which furnished 45 ounces of serum; the sixth was cured by the extraction of 26 ounces of liquid in three punctures; whilst in the 7th, 8th, 9th, and 10th, who died, as well as the 12th and 15th, it was not practicable to make [respectively] but two, one, two, two, one, and four punctures, which obtained 20, 8, 22, 17, 7, and 33 ounces of serosity. The 11th, 13th, 14th, 16th, 17th, 18th, and 19th, which recovered, furnished [respectively] 55, 13, 9, 6, 31, 14, and 9 ounces of liquid, by means of 5, 1, 2, 4, 3, 2 and one puncture for each; from whence we have 9 deaths and 10 cures, on the total amount above mentioned. If it were allowable to count on so large a proportion of successful cases as this, there could be no doubt that paracentesis of the cranium ought to be practised in cases of hydrocephalus. But, on one hand, the observations of Pelletan, many similar attempts, collected in the practice of Dupuytren, together with the facts of M. Bedor and M. Allaire, show that up to the present moment, it has scarcely ever succeeded in France. On the other hand, when we reflect upon the possible chances that certain patients might have of living a long time with a hydrocephalus of considerable size, while by puncture they generally succumb at the end of a few days, we have good ground for not deciding upon this operation without some apprehension. In the halls of the Clinique of the Faculty, I have seen a hydrocephalous child of from 5 to 6 years of age, who in other respects appeared to be in sufficiently



good health. I have also had an opportunity of seeing a child of from four to five years of age, who had the cranium *quadrupled* in volume, and which a man hawked about the country to exhibit as a curiosity. A hydrocephalus of considerable size, did not prevent a patient who was for a long time seen at the hospital of Perfectionnement, from living to the age of 25 or 30 years, and Maréchal gives an instance of a patient with hydrocephalus, who attained to his 70th year. These, however, are but rare exceptions, and no one will dispute that hydrocephalus is almost a certain cause of death. A consideration, moreover, which would perhaps influence me in such cases is this, that the existence of hydrocephalic subjects, being accompanied with more or less complete paralysis, and an absolute annihilation almost of the intellectual faculties, is reduced in fact to a vegetative life, and can be of no great moment either to society, the family, or to the individual himself; from whence it follows, that without deceiving ourselves as to its importance, we ought, nevertheless, to have recourse to this operation in patients who seem in other respects to be placed under the most favorable conditions possible.

#### ARTICLE V.—SPINA BIFIDA.

We ought, perhaps, to have treated of spina bifida, under the chapter on Serous Cysts. But the relations of this description of tumor with the encephalon, have in some sort forced me to examine it immediately following hydrocephalus. Modern surgeons believing that they had established the fact that spina bifida always communicates with the arachnoid or sub-arachnoid cavity of the spinal marrow, have thence concluded that it was a disease placed beyond the domain of operative surgery. Under that view the same opinions have been expressed of this disease as of hydrocephalus, of which spina bifida was considered as nothing more than a dependence or variety which might be called *hydrorachis*. On the one hand, however, it may be supposed that many serous cysts, noticed on the posterior plane of the spine, do not communicate with the envelopes of the spinal marrow, and that they originate outside the dura mater. This is nearly demonstrable, especially in one of the patients operated upon by M. Trowbridge, (*Journ. des Progrès*, t. XVII., p. 274,) and who had a serous cyst, with numerous cells, in the lumbar region. On the other hand, we possess, at the present day, sufficiently numerous examples of cures of tumors of this description obtained by various operations. An infant a year old, and who had one of these tumors along the vertebral column, was relieved of it by means of five punctures (mouchetures, see Vol. I.) by M. Labonne (*Revue Méd.*, 1826, t. II. p. 281,) who professes to have in this manner cured a spina bifida.

An infant aged three months, and who had had a similar tumor from its birth, was submitted to puncture by M. Probart, (*Biblioth. Médic.*, 1828, t. II., p. 120.) Erysipelas and convulsive movements supervened; leeches, purgatives and plasters were had recourse to, and the cure was accomplished. M. A. Hawarden (*Ibid.*) is referred to for a fact in every respect similar, and which possibly might be the same. Two examples of successful results obtained

by small punctures on tumors which were situated on the posterior face of the sacrum, have been related by M. Bozetti, (*Journ. des Progrès*, t. V., p. 253.) An interesting case of this kind has been given by M. Wardrop, (*The Lancet*, 1828, vol. I., p. 308.) The tumor, which was also situated upon the sacrum, was fourteen inches in circumference. After several punctures, it was found at the expiration of six weeks to have been reduced two thirds of its dimensions. But convulsions and death, which then took place almost suddenly, afforded an opportunity of proving that the serous pouch communicated directly with the vertebral canal, and that the spinal marrow was sound. M. Trowbridge, of whom I have just spoken, states that he has in two instances succeeded by excising these tumors after having submitted them to a gradual constriction (constriction). From whence it follows, as it appears to me, either that many of the cysts described under the name of spina bifida, do not communicate with the interior of the spinal membranes, or that hydrorachis with hernia of the cyst, is not absolutely incurable. According to this induction we should naturally be led to conclude that it is proper to treat spina bifida by surgical means. In these cases I think we have it in our power to lay down the following rules: 1. If the tumor is not accompanied with paraplegia and the cyst is not too much attenuated, we ought to wait and confine ourselves to the use of topical astringents or compression; 2. Although there may not be paraplegia, if the cyst is very prominent and with a large base, we should perform the puncture with a lancet rather than with a trochar, and repeat the same operation weekly, at the same time that astringents and compression should also be used; 3. Whether the cyst be attenuated or not, or accompanied or not accompanied by paraplegia, it should be strangulated at its root provided it is pediculated; and we should wait until it is shrunk before incising it outside of the constricting ligature; 4. When paraplegia is present, whatever be the form, volume or thickness of the cyst, the treatment to be employed by preference is repeated punctures. Though the surgeon ought to hesitate with a child who is in other respects in the enjoyment of perfect health, the case, in my opinion, is very different when complicated with a profound alteration in the functions of the spinal marrow. In this state the little patient is devoted to a certain death if nothing is done, and we have seen by what precedes, that by means of an operation there is some chance of saving him. In 1824 I saw at the hospital of Perfectionnement, an infant two months old, who had at the point of the sacrum a serous cyst, which was flattened in shape, of a reddish color, and of the size nearly of the fist; and which was ultimately cured by means of four punctures practised during the space of a month, together with compression, aided by topical astringents, continued about five months. A young boy whom I saw at the Hotel Dieu, in 1835, had on the base of the sacrum a transparent tumor, existing there for several years, and having the size of a large pullet's egg, and which certainly would have received the name of spina bifida, if it had been met with in a new-born infant. I have since learned that this tumor, treated by puncture and afterwards by incision, had ultimately entirely disappeared. As for the rest, it is at the base of

the lumbar region, and on all the posterior surface of the sacrum, that the operation in my opinion presents the best chances of success. There in fact there is no longer any spinal marrow, and the inflammation must necessarily be less dangerous than in the other regions of the spine. Certain it is that, restrained by this idea, I did not venture to meddle with a spina bifida which was situated in the cervical region, another which was found near the middle of the dorsal region, nor a third which was sent to me in November, 1838, by M. Larrey, and which had its seat in the upper part of the lumbar region. I have, however, at the *maison de santé* of M. Dufrenois, made trial of repeated punctures with the lancet on a spina bifida in this last-named region, in a new-born infant. The tumor had the dimensions of two five-franc pieces; its walls were thin and of a bright rose color, and threatened to become ruptured; a first puncture sensibly diminished the paraplegia; it was the same with a second and third, and finally with the fourth. But on the twentieth day, convulsions and other signs of arachnitis announced to us that the scene was changed; death took place at the end of the month, and the opening of the dead body performed by M. Behier, in presence of M. Guersent, showed that a purulent inflammation which had commenced at the cyst, had extended itself throughout the whole length of the spinal marrow, reaching into the cranium. I will add to these details, that in the last century, Orth, (*Thèses de Haller*, t. V., p. 218, Juillet, 1719, French translation,) following Salzmänn, had already endeavored to make it appear that certain cysts which are developed along the track of the spine ought not to be confounded with spina bifida, and that in our time, M. Busche (*Revue Méd.*, 1829, t. IV., p. 118,) has exerted himself to prove that many of those cysts were partitioned (*cloisonnés*) like the ovaries, and without communicating with the cephalo-spinal cavities. The four examples related by this last author, are calculated in this respect to inspire practitioners with a certain degree of boldness. Finally, the case of an infant seven months old, who had in the lumbar region a legitimate spina bifida, which Skimer (*Arch. Gén. de Méd.*, 3e serie, t. II., p. 494) attempted to treat by repeated punctures, was not more fortunate than the one I have mentioned above.

#### ARTICLE VI.—CEPHEMATOMA (*Sanguineous Tumors of the Cranium*).

Sanguineous cysts of the cranium are sufficiently often encountered in new-born infants to induce many practitioners to consider them a specific disease, generally known at the present day under the name of cephematoma (*céphématome*). Having elsewhere (*Art des Accouchements*, t. II., p. 590, 2e edition) treated of these tumors, I will now speak of them only in their connection with operative surgery. These cysts, moreover, have been sometimes confounded with encephalocoele, as is proved by the observations of Le Dran, Trew, M. Michel, and some others. M. Champion informs me that he has seen a surgeon, in other respects a man of great experience, make also a mistake of this kind a short time since. We should, moreover, be deceived if we calculated on finding cephe-



matoma only among new-born infants. Since the publication of the work above cited, I have met in an infant twenty months old, with a sanguineous cyst of more than three inches in diameter, and which covered almost the whole of the frontal bone. Another infant, aged six months, whom I saw with Dr. Demey, had one of similar dimensions on the left parietal bone and a portion of the occipital. A woman, aged 49 years, and a man 26 years of age, presented to me similar examples, one on the right region of the forehead and temple, the other on almost the entire right half of the cranium. Other analogous facts, but less striking than those last mentioned, have also assisted in confirming me in my first opinions on the mechanism and nature of sanguineous tumors of the cranium, to wit: that these cysts are formed by an effusion of blood, which takes place in consequence of vascular rupture or spontaneous exhalation, sometimes between the skin and aponeurosis, more frequently between the aponeurosis and pericranium, quite frequently also between the pericranium and bones, and sometimes between the bones and dura mater. A case noticed by M. Neve (communicated by the author to M. Champion,) would go, in fact, to show that the blood primarily extravasated between the dura mater and cranium, may transude and pass through the bones, and arriving externally, constitute a thrombus or cephalematoma. The mode of curing these tumors is not considered in the same point of view by all practitioners. Puncture, followed by compression and topical resolvents, have obtained decidedly successful results with M. Champion. Others have had the boldness to recur to large incisions, and even to the seton; but I have satisfied myself that with a little patience and some topical astringents, we may almost always succeed in dispersing the tumor without the necessity of an operation. The cephalematoma which I treated in this manner, in consultation with M. Cisset, disappeared at the expiration of a few weeks. The child that M. Démey sent to me, got well in fifteen days. I have seen others which recovered still more rapidly. In the man and woman whom I have mentioned above, the tumors, notwithstanding their extreme dimensions, receded more and more, and ultimately disappeared in the space of a month. It is however true, that in the patient first mentioned, after having made a puncture on the forehead and extracted from it four to five ounces of a sanguinolent liquid, I found that the walls of the tumor agglutinated, and that a complete cure followed.

In conclusion, then, I would, in these cases, advise temporization, afterwards compresses wet with a solution of muriate of ammonia, tannin or alum, or some other astringent liquid. Puncture would not be admissible until after unavailing attempts by compression, or unless at the end of a month's treatment, the tumor remaining stationary, seemed rather to have a tendency to increase. Pure and simple puncture will then, in most cases, succeed, especially if we associate with it for some days a slight degree of compression properly applied. To cover the whole extent of the cyst with a temporary blister, would also be an excellent remedy as an adjuvant to puncture or the simple incision; but the most certain remedy in all these old cases, and especially where the cyst contained scarcely any thing but liquid matter, would be the iodine injection, the same as in cases of

hydrocele. I would not, in fine, decide upon laying open the tumor largely or on many of its points until after having made use of all other means, or unless there should exist some serious accident, or that a suppuration kept up by the cephalematoma had actually become established.

#### ARTICLE VII.—OPERATIONS REQUIRED BY THE DISEASES OF THE FRONTAL SINUS.

There are two regions in the cranium where the diseases may require operations so diversified, that we are almost tempted to make them the subject of two special articles. These regions are the frontal sinuses, and the mastoid process; but as it is next to impossible to separate what relates to this last from the operations required for the diseases of the ear, I shall not treat of it upon the present occasion, but speak only of what relates to the frontal sinus, properly so called. Operations have been performed upon the frontal sinus, in cases of fractures, caries, necrosis, abscesses, hydatids, polypi, the presence of foreign bodies, collections of fluid, and various kinds of degeneration. The relations of the frontal sinus with the interior of the nasal fossæ, and with the cranium and orbit, will always render its diseases difficult to diagnosticate and cure, at the same time that they generally increase their danger. The operations which they render necessary must, moreover, in their nature be sufficiently delicate, and sometimes in themselves formidable.

##### § I.

When from a *fracture in the forehead*, some fragments remain displaced posteriorly, in such a manner as to give rise to accidents, it may become advisable to remove the anterior wall of this sinus, either wholly or in part. Facts of this kind have been related by Fallopius, Trew, Maréchal, Colignon, Jackson and many others. In a patient whose case is given by Horne, (*Acad. de Chir.*, t. VI., p. 203, in 12<sup>o</sup>.) there was a fracture at the superciliary ridge. The ablation of the osseous projection was effected; accidents supervened, and bleeding had to be resorted to eight times; but the patient recovered. Lassus (*Méd. Op.*, t. II., p. 259) and M. Larrey, as well as Fichet de Fléchy, (*Observat. de Méd. et de Chir.*, p. 213,) have related examples of cures obtained in the same way, and without the patients having been exposed to the slightest dangers. Muys, (*Nouv. Obs. de Chir.*, p. 438, obs. 5, decad. 8,) who was already aware that the opening into the frontal sinuses has a tendency to become fistulous, and who, on that account directed his attention to the passage of the air, and then to the rolling up (*recoquillement*) of the skin, recommends that we should be careful to contract (*raccourcir*) the borders of the wound in a proper manner immediately after the operation. It is readily conceived also, that in cases of fracture it may sometimes become necessary to enlarge the pre-existing wounds, at other times to establish new ones, also that if the fragments are somewhat loose, we may be enabled to detach them by means of a good pair of forceps, while, on the other hand, if they remain adherent at some point, it

may become necessary to employ the osteotome, gouge, mallet and trephine. In these cases, the surgeon should not forget that purulent collections are especially to be apprehended in the direction of the orbit, and that in order to prevent them, there is no better method than to leave or to establish a free issue for the fluids in this quarter. The incisions required, therefore, should be placed as much as it is possible to do so, rather below than above the eyebrow. I will add, that it is better to make them large than small, and that the cutting pliers, modern osteotomes and trephine should be employed in preference to the chisel or hammer, whenever their application would not seem to be attended with too much difficulty, or except the slightest danger was to be apprehended from any concussion upon the cranium. It would appear that Langguth (*Thèses de Haller*, translation, t. I., p. 125) had foreseen this danger when he advised the employment of the scissors rather than recur to the trephine. O. Acrell, (Sprengel, *Hist. de la Méd.*, t. VII., p. 31,) on the contrary, confined himself to trephining upon the superciliary ridge, in a patient where the frontal bone had been fractured and driven in. In spite of the unsparing censures of Brandi, in 1763, on the use of the trephine to the frontal sinuses, and the accusation he makes against it, of leaving an incurable fistula, and of being inconvenient in its application, M. Larrey (*Campagnes Chirurg. d'Egypte*, p. 136) employed it with advantage, even in perforating through the cranium; Collignon (*Biblioth. Chir. du Nord*, p. 179) speaks of a fragment of ball which, having become arrested in the upper eyelid, produced an exfoliation of the anterior wall of the frontal sinus, without being followed by any fistula; and we find in the Memoir of M. Gaultier de Claubry (*Bull. de la Fac. de Méd.* t. III.) a great number of instances where trephining of the frontal sinuses was evidently attended with utility.

## § II.—Caries and Necrosis.

Caries and necrosis of the frontal sinuses are a double disease, which there, as elsewhere, are sufficiently often found blended together. Béranger de Carpi and Dulaurens (Portal, *Hist. de l'Anat. et de la Chir.*, t. VI., p. 491) had already noticed that the vault of the frontal sinus was sometimes perforated with holes and, as it were, worm-eaten, and to such extent as to allow of the fluids penetrating into the cranium. Similar facts have since been pointed out by Fabre, (*Ib.*, t. XI., p. 164.) Sellien (*Biblioth. Chir. du Nord.*, p. 100) gives a case of venereal caries, with fungosities of the frontal sinus, and which he cured by means of red precipitate. A man had a caries with softening of the internal orbital process; Janin (*Mémoire et Observations sur les Maladies des Yeux*, p. 290) having made an incision, then excised a portion of the lips of the wound, and removed all the bone he could by means of the bistoury. Camphorated oil was then applied to the remainder of the caries, which ultimately exfoliated and allowed the whole wound to cicatrize. Delpech (*Révue Médicale*, Mai, 1838) speaks of a necrosis, the extraction of which left a large opening into the nose and frontal sinus, which opening he treated by rhinoplasty. The frontal bone was altered to the extent of an inch; a crown of the trephine and some strokes upon the gouge



removed the caries entirely. Obstinate hemorrhages took place at first, but the patient nevertheless, says Cavalier, (*Société de Médecine de Marseilles*, 1817, p. 38,) got well in the space of a month. M. Riberi, (*Gaz. Méd.*, 1838, pp. 795, 796,) in two cases with caries, accompanied by necrosis of the frontal sinus, was not enabled to succeed, except by means of the gouge and mallet. So that examples at the present day are not wanting to show the resources of surgery in cases of necrosis or caries of the frontal sinuses. In these cases, the operation to be preferred is the same as for caries or necrosis in general. It ought moreover to vary according as the disease is more or less extensive, or according as it exists in a simple state, or with different complications. Should the soft parts be sound, it would be advisable to cut from them a semilunar flap, with its free or convex border turned upwards and inwards, so that its lower extremity might terminate on the ascending process of the maxillary bone.

In cases where ulcers and fistulas existed, all that would be required perhaps would be, to enlarge them without making any distinct incisions. In whatever way we have proceeded in laying bare the diseased region, we should, in order to complete the operation, employ the forceps to extract the movable fragments, the bistoury, or a strong scalpel to destroy the softened bones, the chisel or the gouge and mallet, if there were only some splinters to remove, the cutting pliers, or Liston's scissors, in cases where the diseased portion might be very projecting and well circumscribed, and the osteotome of M. Heine or M. Charrière, or even the trephine rather than strokes with the chisel, should it be necessary to go down deep and take away a large portion of bone. Caustics and the red hot iron employed by some surgeons, and again recently by M. Riberi, would not be advantageous in such cases, unless we had to destroy simple fungosities, as in the case related by Sellien, or thin lamellæ.

### § III.—Abscesses.

Caries and necrosis of the frontal sinus frequently result from an abscess which has formed in the interior of this cul-de-sac. The pus confined in an unyielding cavern, ulcerates the mucous membrane which lines it, denudes it, soon mortifies its walls, and finishes by making a passage to itself, either in the direction of the orbit, or the nasal passages, or even into the interior of the cranium; but besides that such purulent collections in themselves involve sufficiently severe dangers, there may also result from them fistulas or an alteration of the bone which could scarcely be cured but by one of the operations which have been described above. It would be advisable, therefore, to remedy the difficulty in the beginning, if it can be done. Although Borelli, Bartholin, Boetius, Tulpius, Marchettis, Chevassieu, D'Audibert and Celier, have seen cases where abscess in the frontal sinus has got well by making its way through the nasal passages, Richter (*Bibl. Chir. du Nord.*, p. 242 to 249,) nevertheless advises that we should endeavor to re-establish the natural passages, or to create a new one, rather than to destroy the mucous membrane of the sinus. Sauvages, (*Nosologie*, t. VIII., p. 345,) who first makes trial of detergent injections, also prescribes the trephine. An abscess

of the frontal sinus having invaded the ethmoid bone, led to the supposition that it had extended to the maxillary sinus, which was unnecessarily perforated. Other remedies, says Jourdain, (*Maladies de la Bouche*, t. II., p. 101,) directed to the frontal sinus, effected the cure of the patient. In another, Jourdain (*Op. cit.*, t. I., p. 78,) destroyed the anterior nasal wall of the maxillary sinus, in order to reach into the frontal sinus, which was filled with pus, and to introduce injections into it; Frank (*Médec. Prat.*, t. V., p. 38, French translation,) says a physician of Vienna has frequently trephined the frontal sinuses in order to extract from them inspissated mucosities. I should certainly however not recommend that we should go to the extreme of trephining the forehead, for the sole purpose of extracting mucosities or some few drops of pus accumulated behind the internal orbital process. So long as the collections in this cavity have not disorganized its walls, there is reason to hope that they will make their way through the nares; and this is the termination which we ought to encourage by means of fumigations, injections, or even sternutation, before thinking of the trephine. But should the disease have been of long standing, and have resisted every thing, and caused violent pains and severe accidents, and that its diagnosis can be clearly made out, trephining in my opinion would be the best remedy. Two processes may then be employed: either after the manner of M. Riberi, we may incise the soft parts in the upper portion of the great angle of the eye, and perforate with a punch or the perforating trephine, or with the scalpel only; or what is better, with a small crown of the trephine, the upper part of the os unguis, or the ascending process of the maxillary bone, and the extremity of the internal orbital process, in such manner as to penetrate into the nares and create there a passage for the liquids, and to be enabled to shut up the solution of continuity in good season, without having any apprehension of the formation of a fistula. It is important under such circumstances to avoid wounding the lachrymal sac, and the tendon of the orbicularis muscle; also, it would be advisable to cut out a semilunar flap whose free border should look inwards and forwards. No doubt this method would be successful, if the collection in the frontal sinus was prolonged very far downwards, and if it were not yet complicated either with caries or necrosis. Otherwise it is better directly to attack the frontal sinus itself; taking care if it is not yet ulcerated to open it at its most depending part, that is to say, between the upper eyelid and the top [or the inner extremity (*la tête*)] of the superciliary ridge. The operation moreover would, in almost every particular, be the same as that which I have pointed out in the preceding case. It would differ from it only in having to prolong the incision in the form of an arc a little higher up and somewhat more outwardly, and that the trephine and perforators would act exclusively on the frontal bone, instead of including at the same time both the maxillary bone and the os unguis.

#### § IV.—*Foreign Bodies.*

Besides pus, there have been found in the frontal sinuses, under the character of foreign bodies, clots of blood, polypi, stones

worms, &c. Chaptal, the father, (Sauvages, *Nosologie*, t. VI., p. 177,) having noticed that pains of the head which had persisted with violence for a long time, disappeared in consequence of a nasal hemorrhage, concluded on that account, without, as it seems to me, being perfectly authorized to do so, that blood retained in the frontal sinus had been the cause of this suffering. Instances of calculi in the frontal sinus, related by Bartholin, F. de Hilden, and Schenckius, are somewhat more positive, since an opportunity presented of identifying the objects by direct observation. The same may be said of the cases of a *tent* there mentioned by Hølegost, and also those of a *ball* which, according to Zacutus Lusitanus, would constitute conditions calling for the application of the trephine. Cesar Magatus (*Journ. Gén. de Méd.*, t. XLV., p. 331.) says a patient was cured by trephining his frontal sinus for a *worm*, and Rossi (*Médec. Opér.*, t. II., p. 116, note 5,) had recourse to this operation in order to place a ligature around the root of a *polypus*, which he afterwards extracted through the nares. A fistula which was thereby caused in this case, lasted for the space of three years, and was not cured until after the rupture of the osseous lamina which separates the sinus from the nasal cavities. In the case of M. Hoflman (*Rév. Méd.*, 1826, t. II., p. 152,) it became necessary after the extraction of the polypus, to pass a seton from the sinus into the nose. M. Langenbeck (*Biblioth. Chir.*, or S. Cooper's *Dictionnaire de Chir.*, t. I., p. 439,) finding a large tumor external to and above the root of the nose, had recourse to the trephine in order to open into it, when he recognized that it was made up of an enormous *hydatid mass*. A cavity two and a half inches deep remained at the place which the tumor had occupied. Other foreign bodies also have been noticed in the frontal sinus: Salzmann (*Convulsions des enfans*, p. 248,) states that he has found and killed worms there. M. Maunoir (*Questions sur les corps étrangers*, p. 204,) and also M. Breschet (*Dict. des Sc. Méd.*, t. VII., p. 4,) speak of *balls* retained in this cavity for the space of three months. M. Larrey (*Campag. Chir.*, t. IV., p. 89,) relates that the Chevalier Erasme retained the point of a *javelin* for fourteen years in the frontal sinus. M. Dezeimeris (*L'Expérience*, t. I., p. 572,) has extracted from the cartons of the ancient Academy of Surgery, the case of a fungous tumor of the form of the patella, and which was situated in the frontal sinus. M. Brunn, (*De Hydrope Cystico*, &c., Berlin, 1829; *Journ. des Progrès*, t. II., sér. 2, p. 255; *L'Expérience*, t. I., p. 568,) a Prussian surgeon, speaks of a young girl who, being tormented by a supra-orbital tumor, died after having been submitted to a crucial incision upon the same and the employment of the seton. Now this tumor, which was attended with a sero-sanguineous liquid and a fetid suppuration, and which was five and a half inches long and four and three-quarters in breadth, situated in the frontal sinus and composed of cells or small bladders, which had become developed in the space of five years, might have evidently been extirpated if it had been attacked at an earlier period and in a proper manner; an instance of a hydatid tumor of the forehead had already been mentioned by M. Corby, (*Biblioth. Médic.*, 1829, t. III., p. 20,) but in this case the disease was altogether independent of the sinus. The presence of foreign bodies in the frontal sinus would still



more positively call for the application of the trephine than any other of the diseases of which I have hitherto spoken. Their diagnosis, therefore, is a point of great delicacy. As to the operative manual here, also, two modifications would be offered, according as the sinus was intact or already laid open. In the first case it would be necessary to cut down in such manner as to lay bare the tumor extensively, and in preference by the semilunar flap which I have indicated in the beginning. The crown of the trephine would be better adapted here than any where else, and even than the other osteotomes: only that it would be advisable to apply two small ones, one on the side towards the orbit below, the other at the top [inner extremity] of the superciliary ridge above, which should be done in order to obviate the inconveniences which result from the irregularities of the frontal bone in this region. The points, bridle or bridge left between the two crowns, could afterwards be easily destroyed by means of the scalpel, cutting pliers or chisel. Should there have already existed any fistulas or ulcerous passages, they could be made use of as a guide by which to reach the foreign body, and the enlargement of these might be all that was required to give to the incisions the form and extent that were necessary. I have no need of remarking that the foreign body itself when once laid bare, may require the aid of the forceps, even the cutting pliers, and elevators and ligatures, and the use of the bistoury and dissections, more or less cautiously conducted, according as it is movable in the sinus or implanted in the bones, or is in a fluid state or concrete. This remark applies also to necrosis as well as to foreign bodies.

### § V.

Though the immediate consequences of this operation might be serious, they are nevertheless ordinarily very simple. One of the most disagreeable is that of often leaving a fistula, which is exceedingly difficult to close up. I have, however, seen this fistula heal up in two instances in patients who had the anterior wall of the frontal sinus destroyed by necrosis, and in a third in whom this wall was lost in consequence of a comminuted fracture. That of P. Gerardi, after receiving no benefit from the dilatation of the frontal sinus through the nares, yielded to the action of a machine similar to that which F. ab Aquapendente and Petit made use of to compress the lachrymal sac, a contrivance which Rossi, (*Médec. Oper.*, t. II., p. 244,) who does not pretend to have invented it, calls a presser (pressoir), and which M. Ribéri, who again revived it in 1838, appears to have employed like his countryman, but without obtaining, however, any real advantages from it. Perhaps it has not been sufficiently examined in these cases if the interior of the sinus was perfectly free of disease. I suspect, in fact, that the fistula here depends chiefly upon certain particles of altered bone, or ulcerations, or points of caries, much more than on the physical and natural disposition of the sinus. I would, therefore, advise before all other steps, that we should carefully explore the parts and remove from the region every thing which has the least appearance of disorganization. If after this, lotions and detersive and astringent injections, and even slight cauterizations should not suffice, I

would then willingly give the preference to perforation of the inner wall of the sinus in its lower portion, and in such manner as to make it communicate freely with the nose. Rossi (*Méd. Oper.*, p. 116, note,) by dilating the internal orifice and breaking the nasal wall of the sinus, succeeded completely. Perhaps even an opportunity would here offer of inserting a large and somewhat short canula constructed after the model of lachrymal canulas. In conclusion, the facts which relate to the operations required for the frontal sinus, are so dispersed through works of science, and given mostly with details so vague, and these operations have been so rarely performed with us, that it would be difficult at the present time to subject them to general rules that are either very precise or very useful. [See a note farther on. T.]

## CHAPTER II.

### FACE.

The operations which are performed on the face are numerous and varied, but many of them have been described elsewhere, (see Vol. I. and Vol. II. of this work, on the respective subjects of *Anaplasty*, *Excisions*, and *Tumors*.)

#### ARTICLE I.—OPERATIONS WHICH ARE PERFORMED ON THE NOSE.

I have not to consider here the different forms of rhinoplasty, the details of which will be found under the chapter on *Anaplasty*, (Vol. I. See also our *notes* there.)

#### § I.—*Tumors*.

Tumors of various kinds may be developed in the nose, the same as in any other region. As I shall have to treat of polypi of the nasal fossæ after having spoken of the operations which are performed on the velum palati, I do not design at the present moment, to touch upon any other than tumors which are situated in the substance of the nose, properly so called. As respects the operation they require, these tumors form two classes, some of them having their seat on the body of the organ, others in the septum.

A. *The nose, properly so called*.—I. We find on the body of the nose three principal varieties of tumors which occasionally require the aid of operative surgery. These are worms (*tannes* or *maggots*), cancers or elephantine masses. In no region, perhaps, are the *sebaceous follicles* more frequently altered than upon the nose. So long as the substance with which they are filled does not exceed the dimensions of a pin's head, and are unattended with any degenerescence of the cutaneous tissue, the disease would not justify any kind of operation. On the contrary, should the crypt itself become thickened and transformed into a tumor which had acquired the size of a bean or the

head of a nail, it might be advisable to attack it by other means than by simple pressure. In such cases the subject of extirpation might be taken into consideration; but cauterization with a crayon of nitrate of silver cut into the shape of a cone, with its point carefully introduced into the aperture and down to the bottom of the sebaceous follicle, will almost always answer. If the tumor were still more developed; if, for example, it exceeded the volume of a small nut, and presented itself under the aspect of a cyst with thin walls, filled with matter of a purely fatty character, then extirpation would evidently be preferable. [See our note above, pp. 60-63, giving the case (with plates) of those enormous tumors of this kind, which I successfully removed at Nassau, capital of the Bahamas, in 1824. T.]

II. Tumors and *cancerous* degenerescences of the nose usually exhibit characters that are altogether peculiar. They are usually rather plates, bumps, (bosselures,) or incrustations, than tumors that are exactly circumscribed, or that can be arranged under scirrhus, or those that are encephaloidal, or melanotic, or of the colloid tissue. Their origin most frequently seems to be connected with a vitiated secretion or degenerescence of the sebaceous follicles themselves. In all cases these tumors, which are usually badly defined, and scarcely found except in persons advanced in age, exact certain precautions in a surgical point of view. The treatment by caustics generally succeeds with them perfectly well. A lady who had one of the diameter of an inch for many years, was cured by means of four cauterizations with the nitrate acid of mercury. An ancient officer of marine, whom M. P. Pelletan sent to me, had, on the left side of his nose, a cancerous, bosselated, sanious plate of a reddish color, which had been there over two years. Every kind of topical and internal treatment had been resorted to in this case. Slight cauterizations with the liquid above mentioned, effected a cure in the space of six weeks. The father of a young physician, in the environs of Nantes, had, on the lobule of his nose, one of those plates, (plaques,) which completely disappeared under the influence of four similar cauterizations; and I could at the present time relate a great number of similar facts. To succeed in such cases, it becomes necessary to clean the tumor carefully of all the crusts with which it may be covered. I then besmear it with butter in the evening and morning, with the view of softening this incrustation the night before each cauterization. All the crusts thus besmeared easily allow afterwards of being detached, and we thus have the altered plate immediately naked before us. I then take a small pinch of lint which has been saturated with the liquid above mentioned, to touch in every part, and even a little beyond it, the surface to be destroyed. The pain which it produces at first is sometimes quite severe. The parts touched by the acid become white, and excite occasionally a slight exudation of blood; there is then formed upon the surface a yellowish crust, which may be detached at the expiration of four or five days, in order to renew the same operation, and so on to the end of the cure. From four to six or eight cauterizations applied in this manner are generally sufficient. If the plate should be composed of an agglomeration of sebaceous follicles, the cone of nitrate of silver introduced to the bottom of each one of them would succeed equally well, and would even be



more suitable. When it is thicker, hard, and of a certain breadth, the *zinc paste* appears to me to be preferable. Having vivified (*avivé*) the altered surface, by means of ammonia or a blister, and taken care to do so effectually, which the nature of the tissue in these cases sometimes renders difficult, we apply over it a plate of zinc paste, (*pâte de zinc*) from one to three lines thick, in such a manner that this plate goes half a line beyond the entire circumference of the tumor; we then fix it here by means of a suitable containing bandage, taking care that nothing is disturbed, at least during twenty-four hours. All the degenerated tissue is transformed, by means of this caustic, into an eschar, which falling off at the end of six to twelve days, leaves in its place a wound whose aspect soon announces that cicatrization is about to commence, and whose bottom dries up and quickly becomes a sufficiently regular portion of the surface of the nose. Moreover it is important, when we employ zinc paste, potash, or butter of antimony on the nose, not to penetrate too deeply, and to remember that in this region the teguments are very thin, and that it would be easy to come down upon the bones or to the cartilages, so as to produce a necrosis there, as M. Champion has seen in two instances. Upon the supposition that the tumor had much more thickness than breadth, we might perhaps attack it with the bistoury rather than by caustics. We should succeed by this method if, after the tumor was removed, the lips of the wound could be readily brought together, either by simple tractions, or after having detached them on their deep-seated surface to the extent of some lines all round. Should the loss of substance be too considerable to do this with facility, we should have nothing more to do than to recur to the resources of rhinoplasty, or be contented with a cicatrization by second intention. This last practice would have to be adopted for the operations performed on the sides of the nose, and between the forehead and the wings of this organ; and in this case there could be no other than advantages follow from cauterizing at the first the whole bottom of the wound. At the root of the nose anaplastic processes present sufficient chances of success to authorize their employment. At the point or the *alæ*, they would become still more important, since cicatrization there by second intention is almost always followed by considerable deformity.

III. *Elephantine Tumors*.—The nose, in certain individuals, is sometimes transformed into a reddish mass of a violet color, at other times simply greyish and covered with bumps, and which has given rise to the expression of *mushroom* or *potato* nose. This alteration, which seems to be no other than an extraordinary development of the natural integuments of the part, may acquire so great a degree of extension that there results from it upon the nose an actual tumor, very analogous as to its nature to elephantine tumors of the scrotum. These tumors have sometimes been seen to acquire a weight of several pounds. As they do not cause any pain, rarely ulcerate, or undergo any transformation of a bad character; and as it is also almost impossible to get rid of them by other than by surgical means, patients do not usually pay any attention to them until they have arrived at a very advanced stage of their development. Imbert de Lonnes (*Opér. Faite*, le 16 Brumaire, an VII, in 8°, 8 pages,) has published a very remarkable exam-

ple of one. A former mayor of Angouleme had on his nose a bosselated tumor of the weight of about two pounds, and which hung down as far as the chin, hermetically closing up the nostrils and the mouth. This man, in order to breathe and speak, was obliged to bend down with his head forwards. He could neither eat or sleep except by raising up his tumor, which he suspended by means of a sling fixed to his night-cap,—a ligature, which had been made trial of, caused such pain that it had to be laid aside. Imbert then decided upon extirpating it, and was obliged to lay bare the whole surface of the nose, which operation required twenty-two minutes. No accident took place, and the patient got perfectly well, preserving a nose which was not very greatly deformed.

Analogous facts have been related by the Academy of Surgery, (*Mémoires*, t. III., p. 511,) and the work of Hey contains some which are not less interesting. The subject, however, had no longer been spoken of by practitioners, when M. Dalrimple (*The Med. Quarterly Review; Gaz. Méd.*, 1834, p. 136,) communicated new facts in relation to it. In his first patient, who was fifty-four years of age, the tumor hung down upon the mouth and reached nearly as far as the chin; the surgeon removed it on the 4th of August, 1826, and the wound healed up in a month without leaving any disagreeable deformity. Another patient operated upon in the same manner, got well in as short a space of time. In performing this operation in 1831, in a man who was more than eighty years of age, M. Dalrimple was obliged to remove a tumor almost as voluminous as that which has been described and figured by Imbert de Lonnes. No indications of a return have shown themselves since. In these different cases, it is important during the dissection of the parts, that the surgeon should place one of his fingers in the nostril, in order to direct the action of the bistoury, and to guard himself better against every perforation. As for the rest, the removal of maggots, cancers, and elephantine tumors of the nose does not differ from that of diseases of the same kind which are seen in any other region. It would be the same also with erectile tumors: Maréchal (*Archiv. Gén. de Méd.*, t. XXIII., p. 149) successfully extirpated one which was of the size of a nutmeg, and which was situated at the tip of the nose.

IV. I will nevertheless remark, that on this last point it is important to recollect the cul-de-sac which lies under it, and that the lobule of the nose is hollow behind, and generally furnished with walls that have but little thickness. So that in fact this organization renders their perforation almost inevitable when the cutting instrument is applied to it, or the slightest caustic of any activity. From whence there results a species of hole which is readily transformed into a *fistula*, and which being once cicatrized in its periphery, cannot afterwards be closed but with an extreme degree of difficulty. I have met with two patients in whom the end of the nose had been excised in order to destroy a cancer, and in whom this fistula resisted every kind of attempt directed against it. A young girl, who in falling from her bed cut her lip and the lobule of the nose, in striking her face against a chamber-pot, which she broke, rapidly got well of all her wounds, with the exception of a point of the lobule of the nose, which remained fistulous. I was not however enabled to cure this

fistula, until after having abraded it by means of the bistoury, and reunited its borders by a point of the twisted suture. The attempt at reunion by every different kind of bandage or plaster, cauterizations with the nitrate of silver, nitrate acid of mercury, and the head of a probe heated to a white heat, which had been made trial of during the space of two months, had completely failed. We should have, therefore, in such cases, to resort to abrasion and the suture, provided the suspension or the elevation of the end of the nose by means of adhesive plasters or any kind of bandage and cauterizations well applied, did not answer at first.

B. *Tumors of the Septum*, (cloison.)—The septum of the nose in front of the cartilage which divides the nares into two passages, is quite frequently the seat of tumors, to which the moderns only have paid any serious attention. These tumors sometimes concrete, but most usually liquid, establish themselves between the two tegumentary layers which are continuous from the exterior to the interior to line the nasal fossæ. An English surgeon, M. Fleming, (*Dublin Journal*, 1833; *Gaz. Méd.*, 1833, p. 798,) has frequently met with tumors purely sanguineous in this part, a disease which is sufficiently common in that country, says the author, in consequence of the mode of attack which the English so often make use of in their pugilistic combats. M. Cloquet (*Journ. Hebd.*, No. 91, p. 544, 1830) appears to have observed abscesses here very frequently, and M. A. Bérard (*Arch. Gén. de Méd.*, 3e série, t. I., p. 408) has published two cases similar to those of M. Cloquet. I have also on my part seen in the substance of the sub-septum of the nose, collections of blood or of pus and masses that were semi-concrete, and, as it were, tuberculous. Whether liquid or concrete, the tumor, nevertheless, in such instances, protrudes on each side into the openings of the nose. If it is a deposit of blood from external violence, time and topical resolvents will generally remove it in the space of fifteen days or a month. In case of failure, we should have at a subsequent period to treat them by incision, or in the manner I have said of céphalématomata. Abscesses should be laid open as soon as possible upon one side, and freely, if the same sac projected to the right and left; upon two sides, on the contrary, if there were two abscesses there in place of one. We should proceed also in the same manner if the abscesses were simply tuberculous, except that we should then have to apply afterwards the nitrate of silver throughout the whole extent of the morbid cavity. For tumors that were purely concrete, or where there was an alteration of the anterior border of the cartilage of the septum narium, we should have to proceed in another way. In describing the sub-septum of the nose, Bichat indicates the possibility of an *operation*, which up to the present time had existed only as a project, but which M. Rigal has performed. In backing on the median line, the cartilages of the lobule leave between them a small groove, perceptible even through the skin, which enables us to separate them apart by means of the instrument, and to penetrate as far as to the septum narium without opening into those cavities. A cancerous tumor developed under the anterior nasal spine, and which had gradually extended in front, downwards, and on the side, as far as to the alæ of the nose, had nevertheless scarcely altered the tegumentary layer.



Two incisions, united in front and passing around behind and outward in such manner as to represent a  $\lambda$  reversed, having surrounded the cancer laterally, it became easy, by means of a transverse incision, to detach it below from the upper lip, then by doubling back the two lips of the first wound, to arrive at the cartilage of the septum, to excise its anterior border and remove the entire morbid mass. The sides of the division were afterwards brought together, and the cure was uninterrupted by any accident, unless it was that the progress of the cicatrization, by drawing the tissues backwards, had ultimately flattened a little the alæ and the top of the nose.

## § II.—*Occlusion and Contraction of the Nares.*

In consequence of confluent small-pox, syphilitic or other inflammations, rhinoplasty itself, and all lesions in fact which may alter the form of the nose, the anterior opening of this organ is liable to become closed up, or at least to be narrowed to so great a degree as to interfere very materially with respiration.

A. *Ordinary processes.*—We remedy such inconveniences by three different modes: 1. Dilatation; 2. Incision; 3. Excision. It is rare that dilatation alone suffices; it is besides applicable only in cases of narrowing, and not of entire closure of the passages. Incision in its turn almost always requires dilatation to be associated with it. Excision becomes useful only where tubercles or morbid projections are to be removed. Should the opening be merely narrowed we incise it by numerous excentric cuts, and to greater or less depth, according to the extent of the disease. When it is entirely closed up a narrow bistoury should then be plunged in at the place which it usually occupies. We make in this manner an antero-posterior incision, the borders of which it would be afterwards advisable, as I think, to divide on two or three points of their length. To prevent the wound or small wounds from reuniting and destroying the effect of the operation, it is recommended to keep them open and separated apart by means of a tent of lint or linen. As we must by every means in our power force them to cicatrize separately, and in the position we have first given them, it appears to me that we might attain our object better by means of a piece of sheet lead rolled up in the shape of a ring, and to which we could moreover give such form as we desired, than by means of the dilating bodies generally employed. It is, however, an operation too simple to require that I should dwell any longer upon it. Nor have I found that it has been as difficult as has generally been said, to give to the opening of the nares again in this manner, their necessary dimensions. A young girl whom I received into the hospital of La Pitié in 1833, and in whom the openings of the nose had been reduced to a small aperture, in consequence of an eczematous affection, which had been for a long time cured, was submitted by me to the excentric incision of the cicatrix, afterwards to dilatation by means of a large canula of gum elastic, and recovered perfectly well. I saw her again more than a year after, and there was not the slightest tendency to any contraction of the anterior opening of the nares.

B. *New method*.—If the incision or the simple excision should not appear to present all the chances of success desirable, there might perhaps be a mode of arriving at something more certain, by adopting the following course. The surgeon, provided with a straight bistoury, would circumscribe the whole of the deformed cicatrix, by surrounding its base on the border of the former opening, and very near the skin of the nose. Afterwards dissecting this circle as if to isolate it, as it were, from the internal surface of the organ, and in such manner, that after having removed the entire arcade of morbid tissue we should have in its place a prismoidal groove, there would be nothing more to do than to bring together the two borders of this new wound by a sufficient number of points of suture. We should thus procure immediate reunion by means of an operation, which leaving no wound, nor any traumatic surface in the interior, would not expose to a new contraction. It would be, moreover, applying to the openings of the nose, what I have proposed as one of the best methods for contractions of the mouth. I will add, that by following this method, it would be rendered almost unnecessary, to keep a canula or any foreign body in the nose during the cicatrization of the wound. Having treated of the manner of reconstructing the sub-septum and the alæ of the nose under the chapter on Anaplasty, I do not propose to recur to it again at this time. I will only remark, that having seen in 1838 the person formerly operated upon by M. Gensoul and previously by Dupuytren, I was enabled to ascertain that the flap borrowed from the upper lip and fixed to the lobule of the nose, in order to construct the fibro-cartilaginous septum, which a lupus had destroyed in this patient, had maintained itself in a sufficiently satisfactory condition. The only inconvenience which results from it is a slight depression of the lobule of the nose and too great a projection of the sub-septum (or columna) below. This fact proves then incontestably, as do those also which have been published by M. Liston, that the sub-septum of the nose may be perfectly well re-established by means of an elongated flap taken from the middle of the upper lip. (See notes on Anaplasty, Vol. I.)

C. *Rhinoraphy*, or the simple suture of a slit, either in the alæ or in any other part of the nose, as practised with success by M. Roux, and also by myself, being no other than a modification of rhinoplasty, or subject to the same rules as cheiloraphy, does not require to be described separately.

## ARTICLE II.—LACHRYMAL PASSAGES (voies).

The *nasal canal*, formed on the inside by the posterior border of the ascending process of the superior maxillary bone, and the anterior third of the os unguis, and altogether below by a small lamella of the inferior turbinated bone; outwards, forwards, and backwards, by the maxillary bone, and its turbinated bone, and then in a slight degree by the ensiform process (crochet) of the os unguis; having a length of three to five lines; circular at the middle part; a little wider from before backward than transversely, on its upper portion; and terminating below by an orifice which flares open in the manner of a funnel,—possesses in reality no solidity except in

the antero-internal third of its circumference: from whence it follows that in attempting to pass an instrument (traverser) through it, it is very easy to break its other walls, and penetrate either into the nasal fossæ or the maxillary sinus. The lachrymal groove (*la gouttière lacrymale*,—i. e. gutter,) which seems to prolong its internal wall as far as to the corresponding orbital process of the frontal bone, and which is more and more superficial in proportion as we ascend into the orbit, presents on the other hand inferiorly two lips, which are easily recognized; one anterior belonging to the ascending process, the other posterior and formed by the outer crest of the *os unguis*. The fibro-mucous membrane, which lines the nasal canal, and to which it is but slightly adherent, becomes much stronger and more complicated in the gutter, where it takes the name of the *lachrymal sac*. Here the direct tendon of the orbicularis muscle crosses its anterior face at a right angle, as if to divide it into two halves, the one superior upon which this tendon sends off a fibrous expansion, known under the name of reflected tendon, the other inferior and lined outwardly by cellular tissue, and which has boundaries which it is exceedingly important should be understood. This last mentioned portion [of the lachrymal sac] is always confined within that triangular space, which is bounded above by the direct tendon, below by the border (rebord) of the orbit, and outwardly by a vertical line which would fall upon the outer side of the *caruncula lachrymalis*. It is, moreover, covered only by some fleshy fibres, and by lamellar tissue, and the teguments of the nasal angle of the eye. Being but feebly supported by the surrounding tissues, it readily yields to the influence of causes which have a tendency to dilate it, and thus frequently becomes the seat of tumor and of *fistula lachrymalis*.

The apertures for absorbing the *tears*, (*puncta lachrymalia*), and which are surrounded by a small elastic and dense, but not cartilaginous circle, have a direction perfectly vertical, but form a very distinct angle (*coude*) where they become continuous with the lachrymal duct, properly so called. This last, which traverses only the inner fifth of the free borders of the eyelids, is situated more especially upon their posterior portion. Being formed by the mucous membrane only, it is exceedingly thin, and superficial in its postero-superior half; while the remainder of its circumference, making part of the body of the eyelids, presents in front and below a far greater degree of solidity of texture. Now, it is this anatomical arrangement which obliges us to enter perpendicularly at first, in order to rest afterwards much more in a direction towards the eyelid than the eye, when we catheterize the lachrymal ducts themselves. At their entrance into the sac these ducts are sometimes separated by a small projection or sort of spur; frequently also, they unite together by one opening. Taken together, the lachrymal sac and nasal canal present a double curve, which has some resemblance to that of an Italic *S*, that is to say, that the first [the sac] is slightly convex posteriorly and inwards, while the second [the nasal canal] is so in the contrary direction; so that in order to perform catheterism on the upper eyelid, we must take care while the probe is traversing the sac, to incline its lower extremity rather forwards and outwards, than in an opposite direction, and that in order to traverse the nasal canal, it is



better, on the contrary, to push the instrument from before backwards, and from without inwards. As every one must have remarked, the axis of the nasal canal in its relations with the supra-orbital projection, presents very numerous modifications; as does also the depth to which we have to go to find it in the orbit. In persons in whom the root of the nose is flattened and broad (large) it appears to be thrown outwards, and perceptibly contracted. When on the contrary, the ossa nasi (les os carrés) are very nearly approximated to each other at their inner surface, we cannot reach it except by coming much nearer to the median line. When the frontal bone is very projecting, and the maxillary bone very prominent, the nasal canal (conduit des larmes)\* is found at a very considerable distance from the posterior surface of the direct tendon, while in persons who have the canine fossa very deep, and the forehead depressed, it appears to come out a slight distance beyond this tendon. The species of valve or diaphragm which contracts its lower extremity, is usually perforated only in its posterior half. Its orifice [i. e., the outlet of the nasal canal into the nostril, T.] is situated at the depth of six or eight lines in the nose, at the apex of a cavity which is bounded in front by the base of the ascending process of the os maxillare, and inward by the concave surface of the inferior turbinated bone. As this cavity is prolonged a little more in front of than posteriorly to the lachrymal valve, it happens sometimes that catheterism at this lower part (cathéterisme inférieur) is very difficult if the surgeon is not aware of this arrangement. The length of the nasal canal itself rarely exceeds from six to eight lines. Demours has met with *bridles* in the nasal canal. M. Taillefer (*Thèse*, Paris,) describes a membranous duplicature [repli] which was situated in its upper third, and the free border of which, directed downwards, sent off several filaments, which attached it to another point in the same canal; so that if a probe had been passed from below upwards it would evidently have been arrested by this anomaly. Different authors whose observations are given by Sandifort, relate examples of small calculi found in the lachrymal passages; similar instances also have been since related by Schmucker, Eller, Walther, Krimer, M. Levanier, M. Graefe, and formerly by Kern. More than this, the nasal canal has been found entirely closed; Morgagni gives an instance where both were closed, [en relate un exemple double,] and Jurine as well as Dupuytren, have both met with one. The *lachrymal passages* may be the seat of lesions in each of their three principal divisions, viz., in the sac, the ducts and the puncta lachrymalia, and also in the nasal canal.

### § I.—The Puncta and their Ducts.

A. The puncta and lachrymal ducts may be *obliterated*. Small pox, purulent ophthalmia, a long protracted blepharitis, wounds and ulcers on the internal portion of the eyelids, are the principal sources of this alteration. The tears being then no longer able to penetrate

\* As our author a few lines above applies *conduit lacrymal* to the lachrymal or tear ducts properly so called, this inadvertence might lead to ambiguity, but for the subsequent rectification it receives by his admirable anatomical precision. T.

into the sac, run over upon the cheek, so that the eye is moistened as if weeping, (lave,) while there is present at the same time a peculiar dryness in the corresponding nostril. We may then have present epiphora, an alteration, or even the disappearance of the punctum lachrymale, and ulcerous, purulent, atrophied or hypertrophied condition of the border of the eyelids, and afterwards of the nose, with the absence of all kind of tumor or fistula lachrymalis.

Gunz states that he has seen a case of this kind in which however the tears found their way into the nasal canal by means of porosities which were recognizable to the naked eye. This kind of alteration, which has not been taken notice of but by a few persons, is worthy of additional researches and appears to be altogether incurable. J. L. Petit and Pellier, who pretend to have reconstructed an obliterated lachrymal duct, by passing a sharp pointed probe through the place it had occupied, were certainly deceived by some of the circumstances of the case. Whatever in fact may be the instrument made use of to fray out a passage so delicate as the lachrymal duct, and whatever may be the kind of seton afterwards employed in this passage to keep it open permanently, we may rest assured that the tears will not take that course, and that it will shut up as soon as the dilating body is removed. Such operations therefore are perfectly useless; it is better in such cases to imitate Bosche (Malgaigne, *Thèse de Concours*, 1835,) and cauterize the puncta in order to close them permanently, should there be any trace of them left. If they were merely contracted or only obstructed by some thick matter, all that could be done would be to clean out the passage by means of Anel's syringe and injections. In such cases A. Petit (Peiffer, *Thèses de Paris*, No. 222, 1830) and Lévillé (*Traduct. de Scarpa*, t. I., p. 84,) are of opinion that we ought to establish an opening to the lachrymal sac by means of loss of substance between the caruncula and eyelid, at the place which Pouteau had selected. But it is not probable that such an opening would keep open for any considerable time, nor that it would afford any particular relief. An artificial opening by excision to the duct itself, upon the inner side of the punctum obliterated, would do much better. It continued open in two patients upon whom I had operated with another object in view.

**B. Fistulas of the Duct.**—Should any ulcer or lesion happen to perforate the lachrymal duct on the side towards the eye, there might result from it a particular form of fistula which is one of the most difficult to heal. A thread of gold or silk, or small cord of cat-gut, passed in the manner of a seton through the injured duct, from the punctum as far as the lachrymal sac, is the only remedy that art possesses against an infirmity of this kind, unless we should have recourse to opening the nasal canal on the inside of the eyelids. I have moreover, in two cases, seen the tears pass through the new route, that is, by the accidental aperture into the duct, in the same way as through the natural punctum, without any inconveniences resulting therefrom, and I doubt if fistula of the puncta lachrymalia in reality constitutes a disease.

**C. Cysts.**—Sometimes also one of the puncta of the lachrymal duct becomes dilated in the manner of a cyst. So at least J. L. Petit,

Boyer and Pellier state that they have seen it. As the tumor causes no pain, it should be treated by resolvents, so long as it shall not have acquired such size as to render it too troublesome. It would moreover be unnecessary to extirpate it in order to obtain a radical cure; as it would be equally certain to disappear by laying it open and cauterizing its interior. Formerly they used to expect that there would result from this an obliteration of the duct and probably also an incurable epiphora. But I shall have occasion farther on to refer to some facts which will have a tendency to allay the fears of surgeons on this subject.

D. *Polypi*.—The lachrymal puncta are also liable to a species of small vegetations or kind of polypi. Demours (*Précis des Maladies des Yeux*, 1821) speaks of a small fungus which protruded from the lower lachrymal punctum, and which he cured by excision followed by cauterization.

## § II.—*Lachrymal Tumors and Fistulæ Lachrymales.*

The lachrymal tumor is rarely if ever a dangerous disease: it incommodes by the crustaceous condition which it keeps up on the border of the eyelids, causing thus a predisposition to ophthalmia, the sensation of dryness which it produces in the nostrils, the purulent matters which it forces to flow back upon the eye, and by the deformity it causes in the great angle; but it compromises neither life nor the general health, nor even the physiological condition of the globe of the eye, properly so called. It may however ultimately, and it is thus in fact that it most frequently terminates, give rise to acute inflammation in the sac, then in the neighboring tissues, or it may become transformed into an internal anchylops, and finally produce a fistula lachrymalis. This inflammation of the lachrymal sac sometimes reaches the periosteum of the neighboring bones, as of the os unguis (lachrymal bone), for example, or the maxillary or ethmoid, or even the frontal and nasal bone, so as to denude them and cause necrosis or caries of the inner wall of the lachrymal sac or nasal canal. I have seen this inflammation extend itself to almost the entire side of the face, and terminate in the manner of phlegmonous erysipelas in the eyelids and at the root of the nose. Happily these are but exceptions, and the lachrymal tumor rarely gives rise to any other than a very circumscribed abscess before it becomes transformed into fistula.

*Fistula lachrymalis* therefore is but one of the consequences of the tumor of the same name. It appears to me however that this fistula may in some instances be formed without having been preceded by tumor of the sac.

We may conceive for example, and I have now instances in point, that a loss of substance, either in consequence of certain operations, or we will suppose, from wounds, contusions, burns, or ulcerations, might destroy a part of the free portion of the lachrymal sac in such manner as to establish there an actual fistula. I believe, moreover, to have in two instances seen a fistula establish itself from the exterior to the interior, after the anchylops had already made its way out through the skin. However this may be, fistula lachrymalis is an ulcer



which communicates by an accidental opening with some point in the track of the tears. We should, therefore, by that definition, have to examine fistulas of the lachrymal ducts, those of the nasal canal, and fistulas of the lachrymal sac. But these last only have hitherto been the subject of special attention, and as to the others I have made a few allusions to them farther back. Fistulas of the lachrymal sac are sometimes *internal*, that is, that they may open into the middle meatus of the nasal fossæ, into the sinus maxillare or in the direction of the eye posteriorly to the palpebral commissure; but that they are almost always *external*. Under the last circumstances also, the cutaneous orifice, which, in ninety-eight times out of one hundred, is found in front of the lachrymal sac, may nevertheless occupy another position. I have in one case seen it on the prominence of the cheek, and in another case near the ala of the nose; a sinuous track of more than an inch thus separated the external from the internal orifice of the fistula. Ordinarily there is but one of these orifices; but sometimes the skin at the great angle of the eye is, as it were, cribbled with them. Frequently this orifice makes no projection, but even appears to be a little depressed; at other times it is found situated on the top of a kind of sac which is flabby or flattened, or occasionally more or less distended. It is not an uncommon thing to see it afterwards surrounded with fungosities, and presenting the aspect of an ichorous ulcer of bad character. In fact, nothing is so simple as the mechanism of a lachrymal fistula. The sac, for a long time distended in the state of tumor, is worn through (*s'éraïlle*) or ulcerates; the inflammation extends sometimes suddenly, at other times by imperceptible degrees, to the neighboring layers, and an abscess is formed. Whether this abscess opens of itself or is opened by art, it nevertheless puts the cavity of the sac in communication with the atmosphere through the skin. If the ulceration makes its way directly to the skin, the fistula is direct or complete; if it spreads (*fuse*) or the contrary, either between the periosteum and bones, or among the other organic layers in the direction of the nostril, it is indirect and incomplete, and becomes an exception. We can readily understand how the *os unguis*, which is so thin and fragile, and the osseous plates with which this bone articulates, may ultimately become necrosed and carious, when we reflect upon their relations with such seats of inflammation and suppuration. As the treatment of fistulas in practice has generally been confounded with that of lachrymal tumors, I propose, in this place, to examine under one head the therapeutic of these two forms of the same disease. The treatment of lachrymal tumor and fistula has, at every epoch, occupied the attention of practitioners; after having been for a great number of ages almost entirely pharmaceutical, it became almost exclusively mechanical from the moment when the functions of the lachrymal apparatus became well understood. At the present day opinion seems to have taken another direction. Recognizing that the lachrymal tumor and fistula were the result of an inflamed condition of the nasal canal or lachrymal sac, practitioners finally asked themselves the question, whether the treatment of inflammation, modified according to the individual, and the peculiarities of the diseased region, ought not, in a great number of cases, to have the preference

over mechanical means. At the present time, therefore, before proceeding to surgical remedies, these affections are to be treated by resources of another character.

A. *Topical Applications and General Treatment.*—The first object of the surgeon ought to be to ascertain the causes, whether individual or constitutional, of the tumor or fistula. If the patient under treatment were affected with syphilis, scrofula, or scurvy, it would be necessary, before doing any thing else, to bring about the cure of these general derangements of the economy. It is to be understood, also, that tumors of the nasal passages, orbit or maxillary sinus, as well as any other disease in those regions, ought to be previously destroyed, should they have been the point of departure of the disease in question. If the affection should have developed itself in consequence of any disease of the skin, of the lips, or the Schneiderian membrane, it would also be necessary to commence by removing them. In those instances, quite common, of lachrymal tumor and fistula, which originate, as it has appeared to me, from an eczema of the upper lip and the encrusted condition of the opening of the nostrils, I have made use, with advantage, of a pomade composed of a gros of white precipitate to an ounce of lard, and sometimes also of another pomade containing eight grains of nitrate of silver to an ounce of lard. The parts affected are to be rubbed morning and evening with one of these pomades, taking care to remove the crusts previously, by means of emollient cataplasms. If, on the other hand, the case in question is one that comes under those tumors and fistulas originating from disease of the eyelids, I employ, before all other things, the means proper to cure this last. Influenced by the idea of an inflammation of the mucous membrane of the lachrymal passages, all the school of Beer maintain that we should treat it by debilitating remedies. It is for this reason that M. Mackenzie eulogizes general bleeding, leeches, and water, as a topical application and for the regimen, in the acute, and even also in the chronic state of the disease. M. Lawrence, still more specific, prescribes leeches to the internal angle of the eye and upon the tumor, and compresses wet with cold water as a resolvent.

The credit of this practice might equally well be ascribed to Demours, for this surgeon was in the habit of treating the diseased condition of the lachrymal passages by leeches and regimen; every where he speaks of having cured lachrymal tumors and fistulas of long duration without an operation. Emollients, procrastination, and cold lotions (*les lotions froides*—means of course, cold water,) were his favorite remedies, and we see by the consultations described in his great work, that it was the method also of his father. It is from not having been *au courant* on this subject with the history of the science, that some surgeons among us between 1820 and 1830, supposed that they were the authors of it. In fact, it goes still much farther back; for Manget, in 1693, wrote that fumigations by the nose and general treatment did exceedingly well with lachrymal fistula. Heister, who like Platner was aware that inflammation was the immediate source of this disease, and who compared the affections of the lachrymal passages to those of the urethra, treated them also by injections, bleeding, blisters, and regimen, which are almost

always sufficient he says, if there be not yet either ulceration or caries in the great angle. It is to be added, however, that before M. Gama, M. Guillaume, M. Paris, and some other military surgeons, (*Mém. de Médec. et de Chir. Milit.*, etc., t. XIV—XVI.) but few persons in France, except Demours, thought of combating lachrymal tumor by means of antiphlogistic remedies.

*Practice of the author.*—One consideration naturally suggests itself here; that is, to know to what extent debilitating measures are allowable under such circumstances. A regimen which is quite rigid, with some general bleedings, repeated application of eight, ten, fifteen, twenty or thirty leeches to the temple, mastoid processes or nasal angle, emollient cataplasms, cold topical applications, injections, or aqueous fumigations, continued for two, three, four, and six months, do not at first succeed but in a very small number of cases; afterwards this practice manifestly becomes more painful and dangerous than most of the surgical remedies now employed; from whence it follows that we should be wrong in according too much confidence to this kind of medication, and that we ought to consider well before adopting it. There are some lachrymal fistulas, moreover, which we have it in our power to cure without an operation, by means of a treatment better regulated, and less calculated to disturb the constitution. Thus, unless there are particular indications to the contrary, I would advise neither general bleeding, nor leeches to the temples, or behind the ears, nor a seton to the nape, which Fabricius de Hilden (*Bibl. de Bonet*, p. 394, 397,) recommends, nor a plaster of tartar emetic as eulogized by M. Weller, nor internal remedies; but I willingly employ, and have often done so with success, some of these remedies applied as near as possible to the parts diseased. From six to ten leeches on the track of the nasal canal and lachrymal sac, renewed three to four times in the space of a month, may be useful, if there be remaining a certain degree of inflammation and heat in these parts; the same remark applies to the fumigation of Manget or Louis, and to topical emollients. After this first period it would be necessary to recur, as was already the practice in the time of Rhazes, (Guy de Chauliac, *Traité* IV., doct. II., chap. 2,) to the application of friction to the tumor or collyria between the eyelids. Upon the tumor we may apply either mercurial ointment, that of hydriodate of potash or ioduret of lead, and also temporary blisters. As collyria, we no longer employ the melange, lauded by Rhazes, but may make use with advantage of a lotion of sulphate of zinc, lime-water, a solution of nitrate of silver, and in fact any resolvent or styptic collyrium. Introduced into the lacus lachrymalis, (le lac lacrymal,) these liquids are absorbed there by the puncta lachrymalia, and thus tend to destroy the inflammation which constitutes the obstacle to the course of the tears. Le Dran, who had already employed liquid collyria under this form, and Mackenzie, who has substituted them for the injections of Anel, have obtained with them decided success; I have myself often used them and with very excellent effects. Nevertheless we must not deceive ourselves in respect to their efficacy. Though in the space of one year I have seen four women cured of lachrymal tumor and fistula under the treatment I have just described, I ought to add also that most of the other cases of the same



kind to which I had before been witness, have since returned to me, and convinced me that the cure was not permanent. We succeed by this treatment then only as an exception, and not eight times out of ten, as some persons at the present day have ventured to affirm; but what justifies trials of this kind is, that the surgical means at present known, in spite of their number, nevertheless still leave the treatment of lachrymal tumor and fistula very imperfect and meagre. In truth, the methods which have been from time to time eulogized for the cure of fistula and lachrymal tumor, having almost exclusively for their object the removal of a presumed obstruction, which is sometimes wanting, and which is only in fact the result of another disease, could not have otherwise than failed frequently.

These means, moreover, are so diversified, that in order to appreciate them properly, it is important to separate them into several classes. Thus, among those who have proposed them, some like Méjean and Anel, by means of catheterism and injections had no other object than the cleansing out of the nasal canal by penetrating through the lachrymal ducts; others, namely, Lecat, J. L. Petit, Cabanis, Palucci, Foubert, Jurine, Desault, Pamard and Scarpa, had especially in view the dilatation of this canal. Many persons recurring to the idea of Heister, have supposed it more rational to employ in those parts injections of various kinds, or to apply caustics, in the same way as is done for contractions of the urethra. A fourth group in fine, embrace the methods which, like those of Woolhouse, Hunter, Warner, and many others, were designed to establish a new route for the course of the tears. Among these methods there is a considerable number which would deserve to be consigned to entire oblivion; but as they are still employed by some practitioners, I think it advisable to make a brief review of the greater portion of them. In conclusion, I would divide the surgical treatment of lachrymal tumor and fistula, into four general methods, namely: the method of catheterism and injections, that of dilatation, thirdly, cauterization, and lastly, the method for establishing an artificial lachrymal passage.

B. *Catheterism and Injections*.—To believe Bianchi and Signoretto, Stenon, Valsalva, and Stahl, a veterinary surgeon mentioned by Morgagni, must have already made an attempt to penetrate the tear ducts, by means of very fine styles (tiges) more or less adapted to their object, until Anel attracted attention to this subject in 1716. Portal, (*Hist. de l'Anat. et de la Chir.*, etc., t. IV., p. 486,) in fact, asserts that we find the germ of this principle in Cajus Julius, Plato, Septalius and Duret; but it is easy to perceive that Bianchi was deceived, and that Manget, in reality, is the only one who effected the passage of these ducts before the time of Anel. According to its partisans, catheterism of the lachrymal passages is called for, in tumors, fistula, simple obstruction, more or less complete obliteration, partial or general contraction, ulcerations and chronic inflammation of the lachrymal ducts, sac and puncta, as well as of the nasal canal. We may have occasion for it in order to introduce threads, tents, different kinds of meches, injections, and medicated liquids, and we may perform it either through the eyelids or the nares. This method presents two principal varieties: with it in fact we propose sometimes to clear out, sometimes to modify the interior of the diseased

ducts: in one, the object of the surgeon is evidently mechanical; in the other, it is more physiological.

I. *The mechanical variety.*—*a. Process of Anel.*—Anel had two modes of treating affections of the lachrymal passages: sometimes he endeavored to clear them out (*les désobstruer*) by means of a very fine probe, at other times by the aid of injections that were either detersive or impregnated with some other medicated property.

1. *Injections.*—To introduce injections, Anel devised a small syringe of the capacity of two to three gros, terminating in a very fine syphon, to the point of which was adjusted a copper pipe much finer still. The patient was made to sit down fronting a well-lighted window. With the left hand for the left eye, and the right hand on the contrary for the right, the surgeon gently depresses the lower eyelid and inclines its free border forward. With his other hand he takes the syringe, introduces its point perpendicularly into the orifice of the tear duct, causes it to penetrate in this direction to the depth of about a line; then placing it horizontally, he inserts the little copper syphon to the extent of two or three lines, then presses his thumb upon the ring which is at the posterior extremity of the piston, and cautiously forces forward the medicated liquid into the lachrymal sac. The inferior lachrymal punctum is preferred for this purpose, because the operation by that of the upper eyelid, would in fact be less convenient and less certain. Should the operator prefer placing himself behind the patient, he would depress the lid of the right eye with his right hand, and the lid of the left eye with his left hand.

He might also, were he not ambidexter, employ the same hand for both sides, by taking care to place himself in front for one of the eyes and behind for the other. At first the patient bears these manipulations rather badly: they produce in fact, in some instances, a good deal of irritation. It is only after having gone through with them for several days successively that he gets accustomed to them, and that they become as simple as they do trifling in pain. Saint-Yves and Heister also had recourse to injections, but they made them through the fistula. W. Blizard (*Transact. Phil.*, t. LXX. ; *Journ. de Méd.*, 1781, t. LXXIII.) influenced like his predecessors, by the principle of clearing out the passage, proposed that mercury should be used in the injections.

2. *Catheterism.*—When the injection does not arrive at all, or but in very small quantities into the nasal fossæ, Anel recommends that we should immediately have recourse to the use of the probe. The operator, if to act upon the superior lachrymal duct, places himself behind the patient, gently reverses the eyelid outwards and upwards, with the left hand for the right eye and with the right hand for the left eye, seizes the probe with the other hand in the manner of a writing pen, perpendicularly applies the blunt point of the instrument on the lachrymal punctum, afterwards inclines its other extremity outwards and upwards, as if to carry it towards the external orbital process, cautiously advances it in, draws with his other hand the nasal portion of the lid inwards and towards the internal orbital process, as if to give him a vertical direction, immediately pushes in the probe in this last mentioned direction, taking care when meeting with the slightest obstacle, to raise it up, or

incline it a little either in front or outwards or backwards or inwards, in order to force it in fine to penetrate into the corresponding nostril; after which he withdraws it to have recourse again to the injections. The introduction of this probe is a delicate operation, which cannot be otherwise than fatiguing to the patient. It demands on the part of the surgeon an exact knowledge of the arrangement of the parts. The slightest fold, whether natural or morbid, is sufficient to arrest the instrument, which, in consequence of its small size and flexibility, is in reality incapable of overcoming the least degree of resistance. I will add that in every point of view it is a useless operation, for the lachrymal tumor and fistula are scarcely ever owing to a complete obliteration of the nasal canal. Moreover, if matters that would yield to the action of the probe could be the cause, they might be displaced full as well by simple pressure made upon the tumor. This pressure, which Richter recommends to be made from above downwards, and acting in the manner of injections forced into the urethra, would evidently have more efficacy than Anel's probe. Nevertheless the operation of catheterism continues to be performed and described, because, as will be seen farther on, some practitioners have applied it to the radical cure of fistula lachrymalis itself.

*b. Process of Laforest.*—Perceiving that injections and catheterism by the method of Anel were sometimes very difficult, and believing them moreover to be of unquestionable utility, Laforest and Allouel, nearly about the same time, proposed to penetrate into the lachrymal passages through the nares. To attain his object, Laforest had constructed small plain sounds curved into an arc, and catheters (algalies) of the same form, which were conical and open at their apex and terminated at their base by an ear (pavillon) furnished with a small lateral ring, designed to fix the instrument upon the side of the nose in the interval between the dressings. The plain sound, inserted from below upwards into the nasal canal, was intended to clear it out. After having removed this, Laforest replaced it by the hollow sound, which enabled him to inject by means of a small syringe, the liquids adapted to the nature of the disease. Laforest's sounds in our times have been modified by a number of surgeons. M. Gensoul has given them much more length and a curvature exactly shaped to that of the nasal canal. Those of M. S. Pirondi are of metal at their extremities, and gum elastic in the middle. Those of M. Serre differ only in their curvature from the catheters of M. Gensoul. With this last form of the instruments, catheterism of the nasal canal is in reality very simple, however little we may be practised in it, and modern practitioners are in my opinion wrong in so entirely neglecting to employ it.

II. *Physiological variety.*—The method of Laforest, like that of Anel, has been but seldom used for the purpose designed by the author; but other surgeons have endeavored to combine it with certain stages of the operation for fistula lachrymalis. Heister and Le Dran had already become satisfied that in a large number of cases, injections in the character of topical resolvents might render every kind of operation unnecessary. Briot, for example, as M. Champion also does, was still employing the process of Laforest with the most decidedly advantageous results. These injections,



either from above or from below, are in reality remedies that deserve to be retained. It is in fact obvious, that by directing medicated liquids upon the seat of the evil, we must sometimes succeed in dispersing it; only that the question arises whether by processes still more simple, we should not be enabled to attain the same object, and whether substances introduced through the nose by means of fumigations, as Manget proposed, or by inhalation, would not in the same manner pass into the syphon of the tears, as Monlac and Louis affirm they have caused them to do with success.

C. *Dilatation*.—When the lachrymal tumor has become ulcerated, or does not yield to the processes of Anel, Laforest, Louis and Le Dran, nor to general and local antiphlogistic measures, nor to antiscorbutic and anti-syphilitic treatment, &c., it is admitted that it cannot be cured except by the operation, properly so called. It is not to be forgotten, however, that Maitrejean has seen two fistulas of the most serious character at the great angle of the eye get well spontaneously; that Demours rarely treated it by the cutting instrument; that the ancients, with their extensive battery (*tout leur échafaudage*) of escharotics, styptics and caustics, occasionally made some cures; in fine, that in our own times we have seen cases recover which had been treated only by local bleedings and the soothing regimen. This remark is so much the more important, as we may perceive thereby that all the different methods have occasionally succeeded in effecting a cure of fistula lachrymalis. As this disease is of a character to get well sometimes spontaneously, it is not therefore surprising that compression, already extolled by Avicenna, and for which J. Fabricius, de La Vauguyon, and Schmidt, constructed bandages of considerable ingenuity, and that tents of lint besmeared with an ointment of greater or less activity, and that leeches and emollient cataplasms, should, in a number of instances, have promoted the cure. In November, 1831, an adult man was sent to me at La Pitié by Dr. Grenier, in order to be operated upon for a lachrymal fistula, the existence of which, now of several months' duration, could be satisfactorily established. After procuring a canula, the fistula was found closed up, and when I saw the patient again, at the expiration of three months, the cure continued perfect. If leeches, or any other kind of medication had been employed, the cure would undoubtedly have been attributed to them. In 1836, I saw two similar results at the hospital of La Charité, and analogous facts have been related by MM. Moztehan, Caucanas, (*Journ. Compl. des Sc. Méd.*, t. XXXII.) Demours, and Moulinié, (*Bull. Méd. de Bourdeaux*, 1833, p. 138,) as well as by F. de Hilden, (Bonet, *Corps. de Méd.*, 394—397,) and Fichet de Flechy, (*Observ. Méd. Chir.*, p. 258.) Dilatation comprises two modifications: in one we act on the natural passages; the other, on the contrary, exacts an artificial opening for the introduction of the dilating body. Each of these methods, moreover, includes quite a considerable number of processes.

I. *Dilatation by the Natural Passages*.—a. *Process of Méjean*.—Méjean, perceiving that the employment of injections, and the clearing out of the lachrymal passages by Anel's probe, afforded only temporary relief, proposed to apply to the nasal canal the treatment by dilatation, which had been so long in use for contractions of

the urethra. By means of a fine probe, having an eye at its upper extremity to receive a thread, this author traverses the parts in the manner of Anel, and endeavors to insert the blunt end of the probe upon its arrival near the wall of the nares, into the groove or opening of the canula, (*sonde cannelée*), which has been introduced at the bottom of the lower passage, (i. e. by the nose,) in order to meet the probe, and to draw it through together with the thread attached to it; forming afterwards a noose with this species of seton he unites its two extremities around a pin, which is fixed into the cap or hair of the patient. At the expiration of one or two days, two strands (*brins*) of lint, folded double, are attached to the nasal extremity of this thread, in order to form a *meche*, which is besmeared with cerate or some other medicated pomade, and has another thread fastened to its free extremity. The *meche* is then drawn from below upwards through the nose, and as far as to the upper part of the lachrymal sac. Each day it is to be removed, and its size increased by adding one strand more of lint. To remove it we have recourse to the thread which retains it in the nose, and which between the dressings is to be kept fixed upon the cheek by means of a bit of court-plaster, (*mouche de taffetas*.)

By this process the treatment requires from two to three, four or six months, and the cure obtained is rarely permanent. Out of twenty patients thus treated there are rarely more than three or four in whom the disease does not reappear at the expiration of a few months. The method of Méjean, moreover, presents two difficulties which are not always easy to be overcome. The probe often gets stopped in the lachrymal sac, and does not reach the nasal canal until after long and fatiguing trials. Except we are much practised in the operation, we have generally considerable difficulty in bringing it under the inferior turbinated bone, into relation with the groove or eye of the canula, or in getting hold of it in any manner so as to bring it out.

*b. Process of Palluci.*—Palluci suggested that by introducing a small gold flexible canula (*sonde creuse*) instead of Méjean's probe, we might be enabled to pass through this canula a portion of catgut so fine, that the patient would drive it out in sneezing, when it could afterwards be made use of to conduct in the same direction a thread for the purposes designed in the process of Méjean. But it is obvious that this modification complicates the operation of the physician of Montpellier in place of simplifying it, and that it must be more easy to make our way through the lachrymal passages by means of a probe than with a canula.

*c. Process of Cabanis.*—Cabanis, a physician of Geneva, has suggested an instrument designed for seizing with greater facility Méjean's probe in the lower meatus, and which is composed of two palettes made so as to slide upon each other. Being perforated with holes which traverse the entire thickness of the upper palette, but go only to a certain depth in the body of the lower one, this instrument is first introduced below the inferior turbinated bone, (*cornet maxillare*.) By means of skillfully combined movements the probe is arrested in one of the holes of the two palettes united, by which it is soon securely embraced, (*exactement pincé*.) Cabanis also recommends, after having brought Méjean's thread through the

nose, that its extremity should be attached to the end of a flexible sound covered with gold-beater's skin, in order to conduct this sound with certainty through the lower meatus into the nasal canal, after the manner of Laforest.

*d. M. Bermond* of Bordeaux, who revived this suggestion in 1825 and in 1827, has very justly remarked, that in order to apply it, all that is required is to bring the conducting thread of Méjean to the outside by any mode whatever. Inasmuch as the instrument of Cabanis is not indispensable, and removes only a part of the inconvenience of the process of Méjean, and as the introduction of the probe and thread through the superior lachrymal punctum, counterbalances the advantages which might result from it for the subsequent introduction of a sound, in the manner of Laforest, surgeons have not adopted these modifications.

*e. Process of Guérin.*—Guérin of Lyons, having remarked that a simple thread left to remain in the superior lachrymal duct, excoriates and sometimes lacerates its palpebral orifice, recommended to bring Méjean's tent as high up as this punctum. Desgranges, who, like Guérin, finds it more convenient to reach the extremity of the probe through the nose by means of a small blunt erigne, than with the canula, or the palettes of Cabanis, adopted this suggestion, which Care on his part has more recently endeavored to render popular.

*f.* The process of this last physician, according to what he has stated to me and from what I have seen in the practice of M. Bougon, consists in passing from below upwards or from above downwards, by means of the instruments of Méjean, a meche of raw silk, composed of three, four or six brands, in order that the same may, while traversing through the superior lachrymal ducts and puncture, dilate them as it proceeds. When it has been passed from below upwards, one of its extremities is afterwards fastened to the forehead of the patient, or in the contrary case, upon the side of the nose. With the remainder of the meche we form a sort of peloton which is to be attached in the hair. A. Dubois appears to have several times followed this method, which I have also made trial of in two instances, and which differs in nothing from that of Guérin. Care's meche, by dilating the sound part only, without acting directly upon the diseased point of the organs it traverses, deforms and paralyzes the lachrymal puncta and their ducts. As I have not understood that experience has pronounced in its favor, I do not see any inducement to make any more trials with it.

II. *Dilatation by an artificial opening.*—When in order to dilate the nasal canal we penetrate by an artificial opening, we sometimes make use of temporary dilating bodies, and at other times of dilating bodies that are left to remain in the lachrymal passages.

*Temporary dilatation.*—For this kind of dilatation, surgeons make use of meches of lint, bougies, or metallic bodies.

*a. Meches and Setons.*—1. *Process of J. L. Petit.*—Petit was the first who endeavored to inculcate, that in fistula lachrymalis we ought to exert ourselves to re-establish the natural passage of the tears, much rather than to create a new one for them. His method may be considered as the source of all those that are employed at the



present day. An assistant placed behind the patient draws the temporal angle of the eyelids outwards, in order to stretch the parts; the operator then directs the point of a bistoury into the sac below the direct tendon of the orbicularis muscle, and makes at the great angle of the eye an incision of about six lines; glides in the place of this instrument a canulated sound, which he pushes with more or less force into the nose, through the nasal canal, and makes use of it to introduce a tent or conical bougie of wax, the upper extremity of which should be more or less dilated and supported by a thread. The operation is then terminated. The bougie is to be renewed or at least cleaned every day before putting it in its place, until the canal no longer furnishes any evidence of suppuration, that is to say during two, three, four, five, or six months. At a subsequent period, J. L. Petit thought that he could make a substitute for the canulated sound, by making a groove near the back and on the anterior surface of the bistoury, which would answer to direct the extremity of a blunt probe; but as a special bistoury would be required for each side, practitioners have generally paid no attention to this pretended improvement.

2. *Process of Monro*.—The approbation which the method of Petit first received did not prevent some surgeons from recognizing its defects. According to Monro it would be imprudent to open the sac without supporting its external or anterior wall. It is for this reason he proposes to introduce through the inferior lachrymal duct, a small sound, in order to distend it and to enable him to open it without wounding its posterior wall. Monro also recommends we should force through the nasal canal, by means of a shoemaker's awl, an instrument already mentioned by Guy de Chauliac, rather than with a sound; that by means of the scissors we should prolong the opening upwardly at the risk of dividing the direct tendon, and that in place of the bougie of Petit, we should make use of a small tent of lint or catgut. His precepts have been neglected. The wounding of the lachrymal sac posteriorly, besides being easy to avoid by the ordinary process, cannot involve any danger, whatever M. Rougier may say of it, while that of the tendon of the orbicularis is in itself a serious accident. The employment of an awl would expose us too much to be misled, and to the making of false routes, to render it possible that it can ever be preferred to the blunt-pointed probe and the canulated sound.

3. *Process of Pouteau*.—Introduced from above downwards, the bougie ultimately produces in the great angle an ulcer whose borders are reversed inwardly, and which sometimes leaves as a consequence a cicatrix which is greatly depressed. Pouteau having in vain tried the method of Méjean in a young lady, and not daring to propose the incision of the sac in the manner of Petit, decided upon passing his bistoury between the lower palpebral border and the caruncula lachrymalis, in such manner as to penetrate into the nasal canal without interfering with the skin. There resulted from it, says the author, only a slight ecchymosis, which itself was owing to his having made the incision too narrow. With the exception of one of the Pelliers, but few persons, however, have thought it advisable to imitate his example, though it has since been lauded by Leveillé, and

that M. Bouchet has employed it in one instance with success. The apprehension has been, that the conjunctiva would be too much irritated. Moreover, the inconvenience which Pouteau has proposed to remedy is reduced to so trifling an affair in the modern processes, that at the present day it is scarcely regarded.

4. *Process of Lecat*.—Lecat after having incised the sac in the manner of Petit, made use of meches of lint, which he introduced through the nasal canal from above downwards, by means of a catgut, a fine bougie, or Méjean's probe. In this respect he is the first who has endeavored to combine the method of Méjean with that of Petit; but as his meche also had a tendency to produce the reversion of the borders of the wound, so much dreaded, very little attention has been paid to the precepts that he has endeavored to lay down.

5. *Process of Canolle*, (*Mémoire sur l'état actuel de la Chir.*, par Montfalcon, p. 118, 1816.)—M. Canolle, when he thinks a seton indispensable, inserts a treble cord of a violin (chanterelle) which has been oiled, through the opening of the fistula, as far as into the nasal fossæ. When the patient feels an itching at the back part of his mouth, the surgeon explores this cavity, seizes the foreign body with the forceps and brings it outside; he then introduces a small bougie into the nostril corresponding to the side upon which the fistula is, until he has arrived behind the wall of the palate; he then withdraws this also with the forceps and proceeds to tie it to the extremity of the cord. He immediately withdraws the bougie through the nostril, then follows the cord; it is separated from the bougie, and a thread attached to its extremity. The cord drawn through the opening of the fistula, brings with it into the lachrymal passages the thread to which the seton is attached.

6. *Process of Desault*.—To obviate as much as possible the inconveniences of the preceding processes, Desault gives to the incision of the sac only two or three lines of extent. A canulated sound is immediately made use of to clear out the narrowed canal; a probe or a whitlow sound is then put in its place. A small silver canula, from twelve to fifteen lines long, conical in shape, and having a ring on the side of its pavilion, is brought from above downwards, as far as into the nose, by means of the probe which forms its axis or guide, and which is immediately afterwards withdrawn. The thread is then made to descend into it, and the patient forces out its extremity by making efforts to blow his nose; after which the operation differs in no respect from that of Méjean.

7. *Modification of Boyer*.—In order to be certain of making as much thread as we desire descend through the canula of Desault, we may, after the manner of Boyer, make use of a small probe of three to four inches long, bifurcated below, and terminated above by a ring; then afterwards, in order to extract this thread, have recourse to the little erigne of Deschamps, the dressing forceps, or merely make the patient blow his nose. If neither of these suffice we abandon it in the nose, when in almost every instance the mucosities ultimately draw its extremity through at the end of from twelve to twenty-four hours. In the contrary case, injections driven with a certain degree of force through the opening of the lachrymal sac, would not fail to expel it downwards.

8. *Process of Pamard*.—Pamard and Giraud, embarrassed by the difficulties of extracting the thread according to the method of Desault, devised, almost about the same time, an improvement which many surgeons of our day still make use of. It is a small elastic stem or watch-spring, terminated by a blunt point (*bouton*) and presenting an eye at its other extremity. The head of this spring is inserted into the canula of Desault. Having arrived under the inferior turbinated bone, its elasticity naturally carries it sometimes towards the opening of the nares, and sometimes under the lobule of the nose, where it is easy to secure it either with the finger or the dressing forceps. Nevertheless, when the spring is not well tempered, and even sometimes when it is perfectly constructed, its extremity cannot be disengaged from the inferior meatus of the nasal fossæ but with a considerable degree of difficulty.

9. *Process of Jurine*.—In order to leave as little deformity as possible in the angle of the eye, Jurine performed the operation with a small trochar of gold, and whose canula is pierced near its point. It is plunged in as far as the nose. After having withdrawn the stilet we introduce Pamard's spring; in other respects we conform to the rules established farther back. If, in spite of its apparent simplicity, this process has not been adopted, it is because, in reality, it is more painful and less easy than many others. It will always be more rational to open the lachrymal sac with a bistoury than with a trochar. And then the process of Pamard is preferable to that of Jurine.

10. *Process of Fournier*.—An ingenious modification of the operation of Petit, and which I am astonished to see omitted in our modern treatises, is the one which has been proposed by M. Fournier of Lempde. This physician proposes we should attach a small shot or grain of lead to the conducting thread of Méjean; drawn down by its weight this shot traverses the canula of Desault, and falls of its own accord into the interior of the nose, from whence the patient readily expels it by merely taking the precaution to incline his head forward. G. Pellier had already, with the same purpose, made use of the end of a leaden sound.

11. *Process of Janson*.—M. Janson (*Compte Rendu de la Prat. Chir. de l'Hôtel Dieu de Lyon*, 1822, p. 51) anoints the lachrymal sac and clears out the nasal canal with a whitlow sound, whose notch enables him to direct a catgut into the nasal cavities; he then proceeds to seek for this last with a blunt-pointed erigne; on the second or third day he substitutes for it a silk thread, which serves to conduct from below upwards a small meche of cotton, the size of which is gradually augmented until the cure is completed. This process has the advantage of leaving nothing to appear outside but the portion of thread of flesh color, which, from the great angle of the eye, is concealed under the head-dress of the patient. "It would be difficult for me," says the author, "to relate the number of fistulas operated upon in this manner; but what we may assert as indisputable is the superiority that may be accorded to it over every other method whatever."

12. The editors of Sabatier have also remarked that the combination of the methods of Méjean and Petit may be effected without the



array of instruments brought into use by Desault, Pamard, Boyer, and M. Roux. What need is there, in fact, of introducing successively into the nasal canal, a sound, a probe, a canula, and then a watch-spring? Why not be content to place the thread in the conducting instrument, and to glide this last into the nose as soon as the *lachrymal sac* is incised? The species of spring acting in the canula in such manner as to transform itself into a hook, which was proposed in 1806 by M. Benezech, in order to extract Méjean's probe more readily, would have no advantage over most of the other means which have been hitherto pointed out, and consequently does not require any farther notice.

13. *Process of Jourdan*.—Apprehensive that the whole extent of the evil might not be laid bare, and desirous of avoiding the cicatrix of the integuments, M. Jourdan, imitating Pouteau, has proposed to open the lachrymal sac throughout its whole length, behind the internal commissure of the eyelids within the caruncula. M. Vésigné is doubtless wrong in asserting that it would be generally impossible to conform to this advice; but it is nevertheless true that the process of M. Jourdan offers no advantage over the others, that it would incur the risk of wounding the internal extremity of the lachrymal ducts and of dividing the muscle of Horner, and that it would present more difficulties than any of those that are in daily use.

14. *Process of Manec*.—Should the introduction of the conducting thread of Méjean still present some difficulties, we might readily surmount them by means of the instrument devised by M. Manec. It is a sort of spear-pointed sound, introduced through the nose from below, upwards into the nasal canal, and as far as to the palpebral angle. The spear point is then made to pierce through the anterior wall of the lachrymal sac, and its eye is made use of to draw the thread through the nostrils. What will hinder this ingenious modification from being generally adopted, is the difficulty that many practitioners experience in penetrating with any instrument whatever, into the nasal canal through the inferior meatus.

b. *Bougies and Cylinders*.—1. *Process of Scarpa*.—While in France they endeavored to give popularity to the seton of Méjean, the physicians of Germany, Italy, and England, limited themselves to a modification of the method of J. L. Petit. Scarpa, having no more apprehension of dividing the direct tendon than his pupil, M. Luzardi (*Journal de Méd. de Nancy*, 1825, p. 234) has since had, advises that we should insert into the lachrymal sac and nasal canal, which he first cleanses by means of meches besmeared with red precipitate or nitrate of silver, a leaden pin or a species of conical nail, terminated above by a flattened head, and more or less inclined downwards, in order that it may accommodate itself to the form of the inner angle of the eye. This pin (*clou*), which B. Bell kept in for eight to nine weeks only, ought to be withdrawn from time to time to be cleansed, and reintroduced immediately afterwards. During the first weeks the surgeon himself attends to this duty, and injects with warm water into the lachrymal passages before replacing there the metallic stem, which Scarpa calls the tear conductor. At a later period the patient has no need of any person to attend to the dressing. As soon as the tears flow freely into the nose without

any obstacle, and that the pin ceases to be covered with purulent matter, we may, in fact, dispense with its employment. Nevertheless, it is advisable to continue it for some weeks longer, in order to be more certain of preventing a return. "There are some patients," says Scarpa, "who are so little annoyed by it that they cheerfully carry it all their lives."

2. I have seen at Paris *Dubois* and *M. Bougon*, successfully use a leaden pin, which only differs from that of Scarpa in having its upper extremity merely curved in the form of a hook, in place of being flattened like the head of a nail. After having employed both I give the preference to Scarpa's pin, to which I allow a length only of ten to twelve lines, and to whose point I give a strong curve, while others prefer to have this end in an enlarged base.

3. *Process of Ware*.—There are those who prefer a silver pin to the tent that I have just spoken of. Ware, for example, has given rise to the adoption by many surgeons in England of a silver pin, which in other respects is in almost every point similar to that of Scarpa. After having lauded the canula of Wathen, Ware has substituted for it the pin in question, and maintains that it conducts the tears into the nose by a sort of attraction. We thus perceive that the process of Scarpa was entirely modelled upon that of Ware. Demours, before having adopted the gold canula, employed a silver pin sixteen lines in length and curved into a hook above.

4. *Process of Larrey*.—M. Larrey in his turn substitutes for these instruments a portion of catgut, three to six lines in length, fixed on a plate or sort of button made of taffeta of flesh color, in such a manner that the whole has considerable resemblance to the little candle, known under the name of *veilleuse*. This instrument is removed, cleansed, and reapplied every morning. Adherent by its head upon the skin, and requiring only a small aperture, it is scarcely perceptible at the great angle of the eye and causes no annoyance to the patient.

5. *Beer, Scarpa, and Weller*, eulogise also small bougies or catgut, but under another form.

D. *Permanent Dilatation*.—*a. Permanent Canula*.—According to Louis, Foubert had proposed to place permanently into the nasal canal a silver canula about an inch in length, conical in shape, and terminating inferiorly in the form of a spoon. Bell and Richter have also mentioned this canula on the authority of La Faye, who himself mentions canulas of gold, silver, or lead, left in the canal as a common practice, and without citing Foubert. But Louis having formally censured it, it was scarcely any longer spoken of by the surgeons of that time in spite of the efforts of G. Pellier, who in 1783, gave himself out as the inventor of it, relating in his work facts which plead strongly in its favor. Pellier moreover had modified it very ingeniously. His, which is of less length than that of Foubert, was made to terminate above in a border, and presented in the middle another border; so that being once introduced it became impossible for it to ascend or descend. It does not appear moreover, that it has ever fallen into complete oblivion. Distel says that one of his patients carried one for more than fifteen years, and that he took one of tin from another which had been in place for forty years. I perceive

also by a thesis sustained in 1802, that at the Hospital of Strasbourg no other method than this had been pursued for a long period. M. Marchal, the author of this thesis, furnishes nine cases which are altogether of a conclusive character. In Germany it was employed also by Himly and Reisinger; but it had been almost forgotten in the schools of Paris when Dupuytren recalled the attention of practitioners to it, by giving it only one border instead of two. This border, concave inwards, where it presents a circular groove, is arranged in such manner, that in order to withdraw the canula if any accident requires it, it is sufficient to introduce into its interior the beak of an elastic forceps terminated by two little hooks, whose points turned outwards readily draw it from below upwards. I will however add, that if Ansiaux is to be believed, these modifications of the canula of Pellier had been proposed by Giraud even at the Hotel Dieu, ten years before Dupuytren used them, and that they were adopted at Liege in the year 1806. In place of presenting a border in the middle, that of M. Brachet has the second one at the lower extremity. M. Taddei has approached much nearer than any other person to the views of Pellier, by recommending that we should place a slight border below its upper third. M. Grenier, who considers that the canula only escapes in consequence of its ceasing to be pressed upon in a sufficient degree by the nasal canal, has proposed to construct one which may be contracted when it is compressed, and which on the contrary acquires a larger calibre, like a spring, as soon as it is left to itself. In the year 1756, Tillolig considered that it would be advisable to withdraw it through the nose at the expiration of a few months; while in 1781, Wathen proposed to fix a thread to its upper extremity in order to hinder it from descending, and M. Nicault recommends that we should make use of a cone composed of several plates of sheet lead rolled around each other. Other modifications still have been made to the canula of Pellier. Some persons have proposed to perforate it with holes, the better to prevent its slipping. M. Bourjot finds that of Dupuytren too long, and makes the objection to it, that it ultimately rests upon the floor of the nasal fossæ. M. Blondlot is in favor of a bellied canula, in order to dilate the canal gradually and imperceptibly. The one that I employ terminates in a blunt point, and not like the beak of a pen, which would expose it too much to the risk of chafing the wall of the nasal canal or perforating the bones; but practice teaches us that the form of the instrument is not a matter of importance in these cases.

*b. To introduce the canula* we may, after the manner of Dupuytren, make use of a steel, silver or gold stilet, a sort of lever bent almost into a right angle, the lower portion of which, adapted to the canula, is bounded by a shoulder more or less prominent, and the handle of which, while it is more or less flattened, has a length of from two to three inches. As soon as the canula has penetrated the little wound, we fix it in this point by means of the nail of the forefinger or thumb, during which the stilet is withdrawn. The patient is then recommended to breathe out with force, and if the air is driven through the angle of the eye, the operation is well performed.

A bit of plaster or taffeta keeps the wound united over the canula, in such manner that its cicatrization frequently is completed as soon



as the following day. Ansiaux asserts that before introducing the canula, it is advisable to clear out the nasal canal with a sound or a probe. An incision having been made into the sac, he introduces a blunt probe through it as far down as into the nose, and afterwards makes use of this probe as a stilet to conduct the canula into the nasal canal, the cleansing of which by means of the proper topical applications he also recommends, as Delpech (*Clin. Chir.*, t. II., p. 433) had recommended it to be by cauterization, a practice which is likewise followed by MM. Bouchet and Lusardi, (*Journ. Méd. de Nancy*, 1825, p. 235.) M. Blandino has revived at Paris the modification of the Belgian surgeon, which M. Taddei had also believed himself the author of. M. Cloquet, who does not leave the canula permanently in, until after having made use of tents during the space of some days, and M. Chaumet and M. Bérard, who previously dilate the canal by means of bougies or catguts, gradually increased in size, have also in these respects, gone farther than Ansiaux. To penetrate upon the inner side of the eyelids, as M. Vèsigné wishes, with a view of avoiding a cicatrix, would be truly superfluous, and this assuredly is not a case for conforming to the precept of Pouteau. With a view of rendering the operation still more simple and prompt, M. Daniel has contrived a sort of trochar or stilet, terminated in a lancet point, to carry the canula into the nasal sac in such manner that the operation is thereby reduced to one stage. This instrument, which the author has shown to me, and which is applicable to the most simple cases, would, like that of Jurine, possess the inconvenience of not making a sufficiently extensive incision of the skin, of fraying out with too much facility a false route into the substance of the walls of the canal, and of not permitting the employment of means rendered necessary by a variety of circumstances difficult to be determined beforehand.

c. The canula may be of *silver, gold or platina*; the important point is, that it should possess some degree of solidity, and that it cannot be easily injured. Its size and length ought to vary according to the subject. It is necessary that it should adapt itself as nicely as possible to the nasal canal, and that it should pass a little beyond the lower extremity of that passage. Consequently we ought to recall to mind, that in an adult this passage is from five to eight lines in length, and from one to two lines in breadth. It is also advisable that it should be slightly concave posteriorly, and on its inner side, and that its point, if it is cut in the shape of a pen, should pass beyond the antero-external rather than the nasal wall of the canal which it occupies.

d. *To adapt its proportions to the stature* of the patient at the different epochs of life, M. Grenier has proposed a method which, as it appears to me, attains this object with sufficient precision, viz., that the length of the nasal canal is to be estimated by a line drawn from the point where the incision is made in the great angle to the superior depression of the ala of the nose, at the union of the lower border of the nasal bone with the ascending process of the superior maxillary bone.

e. *Appreciation.*—The use of the canula having been adopted to great extent in France, requires in this place that I should examine

with some care its importance and its inconveniences. Many objections have been made against it. It is, they assert, a foreign body which, by its presence, causes irritation to the system, produces cephalalgia and pains in the face and in the nose, erysipelatous inflammations, phlegmons abscesses and ulceration in the great angle of the eye. Frequently it makes its way upwards under the integuments, and M. Darcet relates twenty-seven cases where its extraction became indispensable. In other cases it falls into the nasal fossæ, and the operation is, so to speak, abortive. All these inconveniences were pointed out by M. Bouchet in 1816, and presented in a correct point of view, in Italy, by M. Pl. Portal. Like Delpech, (*Clin. Chir.*, t. II., p. 433.) M. Ouvrard, (*Méd. Chir.*, p. 265.) Béclard, (*Clin. des Hôp.*, t. IV., p. 106,) and MM. Cloquet, Bourjot and Laugier, (Diday, *Thèse de Concours*, Janvier, 1839,) I have seen it pass through into the vault of the palate. It is even said that, in one instance, it fell into the trachea, and that it became necessary to have recourse to tracheotomy; but this is a statement that requires confirmation. The canula may also get involved in the sinus maxillare, (Ouvrard, *Méd. Chir.* 265,) or into the substance of the alveolar border.

Mucosities and powders that many persons put in their nose, ultimately obstruct it and close up its orifices. Finally, when we are obliged to extract it, we find ourselves under the necessity of performing an operation more difficult than that of the fistula lachrymalis itself. If the instrument glides between the maxillary bone and the soft parts of the face, instead of passing into the nasal canal, as I have seen it do in two instances, it will cause symptoms more or less serious, without having the slightest beneficial effect upon the fistula properly so called. The same result takes place if we force it into the neighboring sinus, or get its point entangled in the walls of the canal, or if it descends between the bones and the membrane of this passage, or in a word, if it does not exactly follow the natural channel of the tears; it is also clear that a large canula cannot be conducted without danger through a canal which is too narrow, and that if we insert a small one into a very large canal the operation will equally fail of success. In answer to these objections I may reply: it is for the surgeon to be prepared to avoid these different mistakes, or at least when he commits them not to throw the blame upon the operative process. In the other methods it is necessary to renew the dressing every day for several months, and there are none of them that have not equally caused cephalalgia, erysipelas, &c. By the process of Dupuytren some seconds only are required to terminate the operation. The patients are cured almost as soon as they are operated upon; no dressing, and no particular care is necessary; most of the patients immediately after resume their customary occupations without thinking that they carry a canula in the great angle of the eye. We obtain in this manner from twelve to fifteen cures out of twenty cases. A young woman who had the canal so narrow that in order to introduce a canula of very small diameter, I was obliged to employ a very considerable degree of force, got well, however, after a slight degree of cephalalgia, during the space of three days; I was, so to speak, obliged to pierce (*tarauder*)

the canal in order to force in a canula in a young man aged twenty-one years, who, nevertheless, was re-established in his health on the following day ; I kept him at La Pitié, and no accident supervened. The worst that can happen after all is, that we may be obliged to withdraw the canula ; for that purpose we have to find the upper opening of the nasal canal, and to seize hold of the foreign body with a small pair of forceps. When any difficulties are encountered, the stilett of Dupuytren with a double hook, the little hook of M. Cloquet or M. A. Stevens, or better yet, the stilett of Caignou, with a double spur, will readily overcome them. We may also make use of a dissection forceps, one of whose extremities has been made to terminate on its inner side by a small curved point. With one of these instruments, the beak of which is placed in the groove of the border, or equally well below the point of the canula, we readily bring it out by making it follow the route which it had already passed. Up to the present moment I have removed this instrument a great number of times, and the dissection forceps ordinarily have, in most instances, sufficiently answered my purpose. We will remark, moreover, that after the extraction of their canulas, patients are absolutely in the same condition as those who would have been treated during the same lapse of time by the dilating method of Petit, and that many then find themselves radically cured. In two patients the canula, which had descended more than half its length into the nose, could not be seized hold of through the lachrymal sac. An ordinary probe bent into a hook, and directed underneath the inferior turbinated bone, enabled me to extract the canula through the nostril. I have also seen that the canula no longer existed in many persons who believed they still had it, and in whom the fistula or the tumor had become re-established ; for it does in fact often disappear without the patient being aware of it. I have seen surgeons give up the idea of extracting it from the impression, as I myself have been in two instances, that it had become incrustated in the bones. If we perceive nothing in the nose, if the canal is free and we strike against nothing above, the canula no longer exists there ; it is useless to look for it. In conclusion, therefore, the canula is not applicable to all cases. When the nasal canal has deviated from its normal direction, has become narrowed in one part or in another in consequence of an exostosis, and its walls are greatly approximated (*resserré*) and indurated ; when it contains ulcers or is the seat of lesions of a still more serious character, it is better to recur to the seton of Méjean, or to some other process better adapted to the case.

Enlightened by a longer experience, I am in fact at the present day obliged to admit that cures by the canula are infinitely less numerous in reality, than I had at first supposed. The error into which many practitioners in this respect have fallen, is owing to the greater number of patients, under the belief that they were cured on the day after the operation, or the day after that, have not afterwards been seen by the surgeon. Desirous to know what had become of them, I have followed them up or caused them to be followed up as much as could be done. I have by this means ascertained that the canula very often ascended into the lachrymal sac during the first four months ; that in a great number of cases, it escaped through the nasal fossæ before



the termination of the second year; that those that remained in their place, became changed, dissolved and destroyed, to such extent as to be of no value; that they sometimes break, (Champion, *private correspondence*, 1839,) become sometimes filled up by a sort of blackish colored putty similar to sulphuret of silver, sometimes by stony or sandy concretions; at other times by lymph, concrete mucus, membranous folds, &c., in such manner that at the end of two or three years, for example, there are few patients who remaining cured preserve it unaltered in the nasal canal; that it merits in fact almost all the objections that Ware makes against it. It is, moreover, in fine, one of the most uncertain remedies that surgery possesses.

*f. Operative Process.*—Whatever may be the method that is preferred in operating for fistula lachrymalis, there is one stage which at the present day everybody performs nearly in the same manner; I mean the opening of the sac and the catheterism of the nasal canal. an order to arrive with the greatest certainty possible into the canal, the operator causes the eyelids to be stretched by recommending to the assistant to draw them towards the temple. With the forefinger corresponding with the diseased side, he seeks in the great angle the anterior lip of the lachrymal groove. After having forced out by slight pressure the mucosities (*l'empatement*) of this part, should any exist, he provides himself in his other hand with a straight, solid and narrow bistoury, the point of which he directs behind the angle of the forefinger in order to plunge it obliquely inwards, backwards and downwards. Having thus arrived in the sac, he immediately raises up the handle of the instrument towards the top of the eyebrow, (*la tête du sourcil*.) in order to descend perpendicularly into the nasal canal. He then takes a stilet armed with the canula, if he wishes to follow the method of Foubert; a canulated sound or a probe, if he proposes to imitate Petit or Desault, and directs the extremity of one of these instruments upon the back or anterior surface of the bistoury in such manner that this last, in coming out, serves as a conductor to the other. When the opening of the fistula is sufficiently large to permit the passage of the canula or sound, the bistoury is not indispensable. In other cases we sometimes comprise the ulcer in the incision, sometimes leave it above, below or to the side; in other cases we pay no attention to it: if it is surrounded with fungosities and that they are troublesome, we in the first place remove them, and afterwards proceed according to the usual rules. When we wish to penetrate into the nasal canal from below upwards, that is through the nose, the operator holding the sound like a writing pen, with its concavity turned downwards and outwards, introduces it into the nostril to the depth of about an inch: now raising a little the pavillon of the sound, in order that the apex of this instrument may arrive under the inferior turbinated bone and glide upon the nasal wall, he gently draws it forward to the distance of six or eight lines from the opening of the nostril. He then turns its concavity little by little outwards and upwards; then by an oscillatory movement skilfully managed, he endeavors by feeling about to make its beak penetrate into the orifice of the nasal canal. We thus arrive without any very great degree of difficulty as high up as to the angle of the eye or even into the lachrymal sac. Force is never required in these cases. Re-

sistance can happen only from the bad direction given to the instrument or some anatomical peculiarities. In inclining the sound too much downwards, upwards, inwards, or outwards, we force its apex against the opposite wall or the periphery of the lower orifice of the canal. The efforts which would then be made, would lead to no result except that of penetrating into the sinus maxillare or orbit, or that of fracturing the inferior turbinated bone, which might be so low down and so strongly incurvated that its free border almost immediately touched the floor or the outer wall of the nose, and thus transformed the lower orifice into an actual canal.

D. *Cauterization*.—Before the channel of the tears was perfectly understood fistula lachrymalis was treated by injections, or by tents or meches of lint introduced into the lachrymal sac, and especially by the application to this part of escharotics and actual caustics. These different methods are already described with a sufficient degree of clearness in the works of the Greek physicians, those of the Arabs, and the authors of the middle ages; only that it was under the same character as the treatment of every other fistulous ulceration. The ignorance which then existed in relation to the anatomical arrangement of the lachrymal passages did not allow them to consider it in other point of view. What Guy de Chauliac says of it proves that Sprengel was deceived in attributing to the ancients the idea of injections of the nasal canal. For more than a century mention had scarcely been made of cauterization, when, in 1822, M. Harveng proposed to create by it a new method of treatment. It was immediately recollected that the nasal canal was somewhat analogous to the urethra, and that its contractions might possibly be submitted to the same kind of medication. At the present day we have two modes of performing cauterization of the lachrymal passages: in one we cause the cauterizing material to be inserted from above downwards, while in the other it is introduced through the nasal fossæ.

*Through the Lachrymal Sac*.—1. *Process of Harveng*.—M. Harveng proposes that after having opened the lachrymal sac, we should introduce through a canula a cautery heated to a white heat, or a meche besmeared with nitrate of silver upon the contracted points of the nasal canal; that we should repeat this one or more times according as may be required; that we should proceed in fact as in the treatment of affections of the urethra by Ducamp. According to M. Vial, whose thesis did not appear until 1824, Mortier, of Lyon, had a long time since promulgated the same idea, which is also attributed to M. Janson, and which M. Taillefer, who also believed himself the author of it, revived in 1827. But it is in reality a mode of treatment which is very ancient, since Heister had already advised to touch the nasal canal with nitrate of silver. Formerly it was adopted by many practitioners. G. de Salicet made use of the green ointment (onguent vert). G. de Chauliac, who prefers the red-hot iron, proposes that we should protect the eye during the operation either by means of a canula, as Alcoatín does, or with paste, as Jésus recommends, or by means of a silver or brass spoon, as practised by Théodore.

2. *Process of Deslandes*.—In the month of May, 1825, M. Des-

landes published another process to effect the same object. An ordinary probe is first introduced into the nasal canal in order to remove any obstructions and to clear out a passage for the caustic-holder; we then glide in its place a second instrument of the same form, having two parallel grooves upon its vertical branch, and which are filled with melted nitrate of silver; this is then turned on its axis in order that the whole circumference of the canal may be cauterized, which finishes the operation.

*Through the Nasal Fossæ.*—I heard in the year 1824, that M. Gensoul, whose labors were published at a subsequent period, dispensed with the opening of the great angle of the eye, and that he applied the nitrate of silver through the lower orifice in the nasal fossæ. M. Bermond, of Bordeaux, in 1825 inserted in the Journals a memoir on the same subject. M. Valat made some mention of it in his thesis, in 1826, and M. Ratier, who, without doubt, was unaware of these different attempts, announced, in 1828, that he hoped to apply the method of Ducamp to the treatment of fistula lachrymalis by penetrating through the lower orifice of the nasal canal.

These different surgeons first proposed to ascertain the place, form and extent of the disease; then to direct the caustic upon it with certainty and ease. In penetrating by the great angle of the eye, as is recommended by Mortier and MM. Harveng and Taillefer, the operation ought not to be attended with any difficulty; by the other method, on the contrary, we must begin by making ourselves familiar with the process of Laforest.

3. *Process of Bermond.*—After having brought the conducting thread of Méjean outside through the natural passages and without any previous incision, M. Bermond without paying any attention to the ulceration of the great angle fixes the thread to the noose of a meche besmeared with wax, which he then draws into the nasal canal in order to receive the impression of the diseased surface (*l'empreinte du mal*). By means of the thread which is attached to the free extremity of this species of bougie, he draws it out through the nose, and puts in its place a tent made of some strands of lint covered with a solid paste, and rendered caustic in the part which is to correspond to the contraction. This process has but one inconvenience, that of requiring the previous introduction of a thread through the lachrymal punctum, duct and sac. We perceive that it is the seton of Méjean rendered caustic; but it might evidently be simplified if, in place of following exactly the natural passages, as the surgeon of Montpellier does, we adopted the precepts of Petit and all the moderns for managing the conducting thread.

4. *Process of Gensoul.*—A small catheter having a curvature exactly similar to that of the passages into which it is to be introduced, is first directed under the inferior turbinated bone and as high up as into the nasal canal, in order to verify the seat of the disease, which is immediately after attacked with a caustic-holder charged with nitrate of silver. More than three hundred patients have been treated in this manner by M. Gensoul, some with the most perfect success, others with only partial results, and many without any advantage at all. In order to give to his stilet and canulas the form that is most convenient, he has taken the exact impression of them by means



of the fusible *alliage* of Darcet. Instruments improved after these principles were shown to me in 1825, by Dr. Blanc, and I was really surprised to see with what facility they could be introduced into the tear duct.

*Appreciation.*—In proposing to cauterize the nasal canal, the surgeons whom I have just named have had no other object in view than to apply the method of Ducamp to the lachrymal passages. It is true, that if cauterization is applicable to the contraction of the urethra, it may also be so for the diseases of the nasal canal; but it appears to me that in the two cases, that neither the action of the medicament that we employ nor the nature of the affection that we propose to destroy, have in all cases been clearly understood. Like those of the urethra, the contractions of the nasal canal are usually kept up by a chronic phlegmasia more or less extended, or more or less accurately circumscribed. In no case could fistula lachrymalis have ever originated from the spasmodic contraction, mentioned by Janin, and to which Richter has given so much importance. Nor does the affection of the eyelids, mentioned by Scarpa, become the source of it except by propagating itself to the lachrymal sac and as far as into the nose, where it causes an engorgement and obstruction of the mucous membrane which may produce an obstacle to the passage of the tears. In other words, lachrymal fistula and tumor depend upon an induration and thickening or a simple chronic phlegmasia of some portion of the lachrymal syphon: but in applying nitrate of silver on organs that have been thus changed, it is not by producing eschars there and in *burning* them that we cure them: but it is by dissipating the inflammation, and by neutralizing and destroying the *stimulus* and the *germ* (epine) which keeps it up, and by bringing about the resolution of the morbid engorgement. It hence follows that nitrate of silver is the only *caustic* which can be reasonably employed, and that those impressions which have so much occupied the attention of practitioners are in a measure useless; that the principal object is to make the caustic arrive in the upper part of the nasal canal when we introduce it from below; and near its lower extremity, on the contrary, when we follow the opposite route, in order that we may make it act upon almost the entire extent of the passage. All the precautions, moreover, that we might take in order to prevent this general action would not attain our purpose. As soon as the nitrate of silver is in contact with the living and moist tissues, it melts and soon diffuses itself in such manner that it is only necessary in the nasal canal to touch a single point to ensure that all the others shall immediately feel its influence. What I here say of cauterization I might apply equally well to dilatation. When a meche or a solid stem is kept either temporarily or permanently in the nasal canal it cannot in my opinion be of any service, except in two ways: 1. By transmitting to the affected surfaces medicated substances that are calculated to destroy the disease; or, 2. By compressing from within outwards the whole circumference of the altered passage. In these cases we cure not by dilating, but in fact by an actual resolute compression, in the same way as we cure œdema, certain eruptive diseases, erysipelas, &c.

*E. Establishment of a New Canal.*—We find in Aetius and Paul

of Egina, that Archigenes had already pierced through the os unguis with a drill, in order to compel the tears or matters to pass into the nose. Sabor Ebn-Sael, quoted by Rhazes and Avicenna, also eulogizes this resource, which is censured by Mesué. We have every reason to believe that Abulkasem, Roger, and the Alcoatín mentioned by Guy de Chauliac, who all applied the red hot iron on the os unguis, effected the same purpose. Certain it is that their predecessor Celsus speaks of the extirpation of the sac and cauterization of the os unguis as a usual practice, and that G. de Salicet advises when the bone is diseased to cauterize it in such manner as to allow the tears to run into the nose, and that this also was the method of J. de Vigo. Almost entirely forgotten for many centuries, this method was again brought into repute by Woolhouse. It is the only, or almost the only method of treating fistula which was employed up to the time of Petit and Méjean.

1. *Process of Woolhouse*.—The operator makes at the great angle of the eye a semilunar incision which includes the tendon of the orbicularis muscle, opens freely into the lachrymal sac, or even according to Platner or M. Malgaigne extirpates it, and lays bare the os unguis; he immediately fills the wound with lint and does not finish the operation until at the expiration of twenty-four hours, or even two or three days, in order that he may be no longer embarrassed by the blood. A sharp probe is then plunged from above downwards, from without inwards, and slightly from before backwards, as far as into the nasal fossæ, through the lachrymal groove or lower part of the os unguis. A meche of lint or small conical canula is afterwards introduced into this opening in order to prevent its closing; then after its borders are cicatrized and become callous, we introduce a gold canula, which is a little contracted in its middle part, in order that it may not escape either inwards or outwards, and that we may leave it there permanently.

2. *Process of St. Yves*.—Saint-Yves, who had remarked that the process of Woolhouse was almost constantly followed by erosion or reversion of the eyelids, perceived that this inconvenience might be avoided by respecting the tendon of the orbicularis muscle in making the incision at the great angle of the eye. He moreover prefers like Guy de Chauliac to perforate the os unguis with the actual cautery, in order to obtain an actual loss of substance.

3. *Process of Dionis*.—Lacharrière, Dionis, and Wiseman, also recommend the employment of the hot iron, which they apply to the internal wall of the lachrymal sac through a protecting canula made in form of a funnel, the first idea of which funnel appears to go back as far as Alcoatín.

4. *Process of Monro*.—Scobinger, Monro and Boudou made use of a trochar for the perforation of the bone, and had less apprehension than Woolhouse of wounding the ethmoid. Ravaton believed that he could arrive at the same result by means of a curved forceps with which he fractured the os unguis to a considerable extent, followed by a leaden canula. But none of these methods can be followed by a perfect cure, "for very soon after the aperture of the bone fills up," says Guy de Chauliac, "and nothing can any longer run into or pass off by the nostrils." Whether the artificial opening

is kept free by means of a meche, or tent, or by a canula analogous to that mentioned by Platner, or a little dilated at its two extremities, like that of Lecat or Pellier, or still shorter or more contracted, like that which Dupuytren used, for example, in the treatment of Ranuncula, or by the hooked forceps of Lamorier, &c., it nevertheless almost immediately afterwards closes up; and it is rare that the contracted canula of Woolhouse keeps a sufficiently long time in its place to render the new passage permanent.

5. *Process of Hunter*.—Hunter believed that he could succeed better by carrying away at once a disk of the os unguis, and the two membranes between which it is placed, in such manner as to form there a circular opening from one to two lines in diameter. To attain this object, he devised two particular instruments: 1. A species of cutting canula similar to the punch of harness makers. 2. A plate of horn or ebony curved in such manner that it could be introduced into the middle passage of the nasal fossæ, and destined to serve as a point d'appui to the punch, while we were acting with the latter from without inwards through the opening of the great angle of the eye. We thus obtain a neat perforation, which only requires to be dressed with a meche of lint to cause its borders to cicatrize and become rounded and callous. As it is almost impossible to apply the nasal plate, and as the perforation with the actual cautery is also accompanied with a loss of substance, without thereby rendering it always successful, no person, with the exception perhaps of MM. Talabère, Rougier, and Janson, who made use of it twelve to fifteen times, and who censures it, have undertaken the operation of Hunter on living man. If however it should be desired to make trial of it, we could easily accomplish it by means of the compass-punch of M. Talrich, or the trephine of M. Montain. The perforated branch of the first of these instruments having been introduced into the meatus, would serve as a point d'appui to the perforating branch, which is applied at the great angle of the eye exactly through the wound of the canal. All that is necessary after, is to press one branch against the other, in order to remove the portion of bone desired without incurring the risk of making a mistake.

6. *Process of Scarpa*.—In our day, Scarpa and others have returned to the employment of the actual cautery, in conformity to the views of St. Yves; that is to say, that after having opened the great angle, as in the simple operation of fistula, without touching, and even at the risk of wounding the direct tendon, they fill the wound with lint, leave it there in this manner during twenty-four hours, or even more, and afterwards direct upon the lower and inner part of the lachrymal sac, a metallic stem heated to a white heat, with which they penetrate into the nose. In order to protect the eye and surrounding soft parts, Scarpa no longer used the simple funnel of Verduc or Dionis, but a conical canula with very thick walls, and which supports a handle several inches long, which is united with its base at a right angle; which canula, figured by Scultetus, and rescued from oblivion by Manowry, is one which Desault also used in practice, and the first idea of which is found in Roger de Palmer or in Alcoatin. Rivard and A. Petit recommend that we should open the sac behind



like Pouteau, and not in front of the eyelid, whether we propose to penetrate into the nasal fossæ, or intend to stop at the canal.

7. *Process of Nicod*.—At a more recent period Nicod has proposed to combine together in this method perforation by means of the trochar, and cauterization by means of the hot iron. In a patient whose nasal canal was entirely wanting, Dupuytren by means of a drill, as recommended by Wathen, made another in the direction of the natural channel, then kept it open by placing a canula there permanently.

8. *Process of M. Laugier*.—Briot having noticed that M. Pécot had, in spite of himself, penetrated in one instance into the antrum highmorianum, and having himself, on another occasion, penetrated through the os unguis into the nasal passage, has furnished the proof that fistula may be cured in this manner, since the affection did not reappear in the two patients whom he mentions. This certainly is better than nothing, but I doubt if, notwithstanding the reasons, and some facts mooted in its favor by M. Laugier, who, transforming this accident into a rule, has proposed to penetrate, at the very first, into the maxillary sinus, and to leave a canula there permanently,—I doubt, I say, if such a method can ever have numerous partisans. Nothing, in fact, proves that the tears, having arrived in the sinus, could make their egress from thence with facility, that they would not produce accidents, or that it would be easy to make an exit for them by piercing the vault of the palate. The perforation of the os unguis would have still fewer inconveniences.

9. *Process of Warner*.—Warner, desirous at all hazards of obtaining a permanent opening for the passage of the tears into the nose, destroyed the os unguis extensively, whether carious or not. In union with the extirpation of the sac, eulogized by Woolhouse, and which M. Jameson has again proposed in our times, the process of Warner has been reproduced by M. Gerdy, since the principal object of this surgeon is to destroy the entire inner wall of the nasal canal.

10. *Appreciation*.—If, as I with so many others have had it in my power to testify, the treatment of lachrymal tumor and fistula by setons, the canula and caustics, will succeed in nine cases out of ten, the process of Woolhouse, already rejected as useless by Marchettis, Solingen, Maitre Jan, and especially by the Nannoni, would in our time no longer be worthy of consideration. So long as it is possible to act on the natural passages, we should, by this hypothesis, be censurable in attempting to create a new one; in the contrary case, it would be more rational to imitate the conduct of Wathen, or pierce through the track of the nasal canal, like Dupuytren, than confine ourselves to the perforation of the os unguis or sinus, as after the manner of Saint-Yves or M. Laugier. Should there be necrosis, we ought then to treat the fistula by one of the other methods, for the disease of the bone requires no other care than it does when situated in any other part of the body. The employment of the actual cautery or chemical escharotics is not without its danger, when they are carried so near the eye: they have, more than in one instance, produced obliteration of the lachrymal ducts, and by this means an incurable epiphora. What would seem to deter still more from the method of Woolhouse is this, that the tears rarely acquire the habit

of falling into the nose, even though the passage which has been opened for them should remain free, (béante.) "As to the mode of cure," says Guy de Chauliac, "by piercing through the nasal channels by means of an awl, it is not approved of by Hében Mesué, and I have not found it effectual, for immediately afterwards the aperture through the bone fills up, and there is nothing which can run through it or flow into the nose;" so that, besides the deformity which it makes at the great angle of the eye, the patient is left with an epiphora, (larmolement, weeping eye or delachrymation,) which is, in most instances, beyond the resources of art; but in my view it is demonstrated, at the present day, that we have very often deceived ourselves on this point, and that we are more than ever justified in still attempting new trials.

F. *Closure of the Canal.*—In the midst of this labyrinth of methods or processes, there is one, perhaps, which has not been examined in a correct point of view; I mean cauterization. Everything authorizes us to believe that practitioners, like Severin, (*Méd. Effic. Exopyrie*, p. 656,) and Scultetus, (*Arsenal de Chir.*, tab. 34, p. 190, 1712,) among others, who had so much confidence in the red hot iron and escharotics, rarely cured fistula lachrymalis but by obliterating the nasal canal. This obliteration, which was proposed by L. Nannoni, was systematized into a method by Delpech, and M. Caffort of Narbonne has written to me that nine patients who were treated in this manner were all cured. A piece of nitrate of silver, as large as a bean, is deposited in the upper part of the canal, while the sac is also cauterized at the embouchure of the lachrymal ducts. The operation is repeated three or four times in the space of twelve days, after which we make use of simple dressing. A hard cord is formed in place of the lachrymal passages, and no epiphora follows! It appears also that Bosche, who cauterized the lachrymal puncta with the the view of shutting them up, had no apprehension from this obliteration; and that M. Malgaigne, like Anel, Gunz, Petit, and Demours, has seen instances where the lachrymal ducts were wanting, and where there was no epiphora produced. If such were the fact, a very simple method might be substituted for all those which have been in vogue up to the present time. The excision of the puncta lachrymalia would be all that would be necessary. I have performed it in two instances, but I can as yet give no statement of the result, except that the tears, notwithstanding, penetrate into the nasal canal, and that I have not been enabled to obliterate in this manner the lachrymal ducts. Cauterization, in the manner of Delpech or M. Caffort, was not successful in the three cases in which I used it. In conclusion, I am of opinion that there remains at the bottom of this subject, a question of physiology and therapeutics which has to be examined.

G. *Anomalies.*—However distended the sac may be, it rarely happens that we are obliged to follow the precept of Boyer. and excise a portion of it, or to have recourse to compression, as Guérin recommends. Cauterization with the nitrate of silver, as advised by Scarpa, would evidently be preferable in the majority of cases.

Excision, however, is a practice which we should be wrong in rejecting absolutely. If it is true that we may in reality dispense with it, it

is also true that it may, in some cases, abridge the period of cure. I have, in four cases, deemed it advisable to recur to it, and have been very well satisfied with it. The tumor, which was half the size of a nut, was of long standing, and with walls very much attenuated. After having laid it open freely from above downwards, and seized one of its sides with the forceps, I removed from it, by one cut of the scissors, an ellipse of four lines in breadth. The cyst, which in these cases is reflected as it were upon the anterior surface of the direct tendon, is only in part formed by the lachrymal sac; so also may we remove a large portion of it without wounding the tendon of the orbicularis muscle. *In place of opening into the great angle of the eye*, the lachrymal tumor has sometimes made its way into the nostril through the os unguis, an example of which is given by Heister. *In internal fistulas*, it is not the re-establishment of the course of tears which is the important point, but the ulcerous affection which is to be arrested or cured. If there should exist a tumor, though the lachrymal ducts and puncta were closed, we should have no other treatment to oppose to them than that of abscesses or chronic inflammations. Compression at first, or resolvents and astringents, and then a cut of the bistoury into the cyst, and the employment of meches or detergent injections, would be all that there was to be done, unless we should incline to leave a canula remaining in the nasal canal. In certain persons the *osseous canal is so small* that we are obliged to employ force, and even a very considerable degree of force, in order to effect the entrance into it either of a canula or any foreign body whatever. The contraction which I have here reference to, is most usually met with in adult individuals who have been affected with lachrymal tumor or fistula from their infancy, and is not to be confounded with that which depends upon an exostosis, or a deviation of the bones, &c.; it is owing as I think to this, that the canal ceasing to furnish a passage to the tears, no longer grows, and undergoes a suspension in its development, which prevents it, at a later period, from being in relation with the rest of the organization; it is in fact the canal of a child in the orbit of an adult. If the explanation which I give of this fact be correct, we should be prepared to meet with still more difficulties for the insertion of the canula in persons affected with fistula lachrymalis from childhood, than in others. I have operated in five instances under this condition of things. A young man twenty-three years of age, who had been affected with a double lachrymal tumor from the age of eight years, and who died at the Hospital of La Pitié in 1834, enabled me to ascertain, by dissection, the existence of this species of contraction. Monro and M. Lenoir appear to have noticed similar facts. It is moreover quite natural, that not only fistulas from childhood, but also very old fistulas should, in general, be accompanied with a contraction of the osseous canal, if it is true that the tears then cease to flow into the nose. Since the alveoli, like other osseous cavities, shrink (*s'affaissent*) when they have been deprived of the bodies by which they were accustomed to be occupied, we may without difficulty conceive that the nasal canal would have a tendency to contract, should it remain a long time without giving egress to the tears.



In other persons I have found the *nasal canal* greatly *dilated*, and in the form of a funnel at its upper part. This result, which is owing to the protracted distension of the sac properly so called, prevents the canula from remaining in its place but with great difficulty, causes it to mount up towards the forehead, or to fall almost inevitably into the nasal passage, at the expiration of a few weeks.

[*The extirpation of the lachrymal gland for the cure of fistula lachrymalis*, was performed with partial success in 1843. (*Revue Méd. de Paris*, December, 1843,) by M. P. Bernard; the weeping moisture, however, continued. This operation had been suggested for the disease in question by MM. Nannoni and Biangini, and has also been performed in extirpating the globe of the eye for cancer, (see *Arch. Gén.*, Avril, 1844, pp. 501-503.) M. Bernard found the gland hypertrophied. T.]

### ARTICLE III.—EYELIDS.

#### § I.—*Ectropion*.

Two causes may lead to the reversion of the eyelids outwards, the protrusion (*boursofflement*) of the conjunctiva and the narrowing (*raccourcissement*) of the skin. This last condition, or *ectropion*, properly so called, is the most serious.

A. *Ectropion from exuberance of the conjunctiva*. This first case, which is generally the easiest of cure and the most rare that we meet with, presents itself under the acute stage or in the chronic form.

I. If the malady is recent, *cauterization*, which had already been recommended by G. de Salicet, by means of a particular kind of cautery, will ordinarily suffice. M. J. Cloquet has in this manner effected the cure of an ectropion of the conjunctiva, which had existed more than a year. Saint-Yves and Scarpa particularly eulogize nitrate of silver in such cases. A good many of the dry collyria would produce the same effect. Calomel and sugar, tutty, the white oxyde of bismuth finely pulverized, with an equal part of sugar candy, especially, have enabled me to effect cures that were truly surprising and exceedingly prompt, by applying them in small quantities (*par pincées*) morning and evening, on all the engorged parts. Cauterization with nitrate of silver, I have found to answer in many patients, while the nitrate of mercury became indispensable in two others in 1837, at the hospital of La Charité.

II. *Excision*.—When these resources have been tried in vain, we may, in a case of necessity, imitate Anel, by passing a noose of thread through the skin near the lids, and act upon it by drawing upon it above, in order to readjust the diseased lid to its normal position, and apply at the place where the thread is, as recommended by J. Fabrice and Solingen, adhesive plasters, by which we attach its other extremity upon the forehead for the lower lid, and upon the face, on the contrary, for the upper; but besides that such means would scarcely ever succeed, it is infinitely more simple, sure and prompt to excise the conjunctiva. This also is the method adopted by all the moderns, and the one which Antylus had already recom-

mended, and which Hippocrates himself advised though obscurely, when the scarifications performed by his ophthalmoxis did not succeed. While an assistant keeps the eyelid turned back, the surgeon with a good pair of dissecting forceps in his left hand, embraces a fold of the diseased membrane sufficiently large to restore the eyelashes to their normal direction, but not so much of it as to turn them inwards; excises this fold from the great angle towards the smaller angle of the eye when he operates on the right eye, and in an inverse direction for the left eye; endeavors to include in his incision the conjunctiva only, and to cut rather in proximity to the globe of the eye than to the palpebral border; and, moreover, for the performance of this excision makes use of a straight pair of scissors, or a pair curved flatwise. A very sharp bistoury or even a good lancet would also attain our object, but the scissors are the most convenient. The blood, which at first flows out abundantly, soon stops of its own accord. The operation is now terminated, and for the subsequent treatment we proceed in the same manner as if the patient was affected with an ordinary or traumatic ophthalmia.

In cicatrizing, the wound pushes back the convex border of the tarsal cartilage towards the skin, and thus by shortening the internal surface of the eyelid, replaces it in its natural relations. To perform this excision, Paul of Egina in lieu of forceps passed a thread transversely from one ocular angle to the other, in order to raise up the conjunctiva. This excision in ectropion, which is disconnected with external cicatrices, is an operation so natural, that we have reason to be surprised not to find it adopted by all the ancient authors. Though it be true that it was performed and described formerly, by a number of authors, it is nevertheless a fact that M. A. Severin is the first, who after having obtained a great many cures by it, established it as a fixed principle in surgery. The remarks of Severin (*Médec. efficace*, part 2, chap. 33,) on excision of the conjunctiva, were forgotten like those of his predecessors, when Bordenave (*Mém. de l'Acad. de Chir.*, t. XIII., p. 150,) proposed it as a new operation, and endeavored to demonstrate all its advantages. It must be evident to whoever reflects a moment on this subject, that the best mode of bringing into their proper line the internal and external coverings of an everted (*renversée*) eyelid, must consist in shortening that which is too long, when we cannot or ought not to elongate that which is too short. Such was the reasoning of Bordenave, and since that time the excision of the conjunctival protrusion (*bourrelet*) in ectropion, has been adopted as a general process in practice. Some surgeons (see Carron du Villards, *Guide Pratique*, etc., t. I., p. 342,) under the impression that they could render this process more efficacious, have suggested that it would be advisable after the excision is terminated, immediately to raise up the border of the eyelid towards the eye, and to keep it adjusted in this manner by means of strips of adhesive plaster or bandages, in order to favor the approximation of the two lips of the wound which has been established upon the conjunctiva. Others, as Dzondi (Guthrie. *Maladies de l'Œil*, 1830; Carron du Villards, t. I., p. 343,) especially, have gone so far as to propose the excision of cutaneous cicatrices,

when any exist, or to make a semilunar incision upon the root (la racine) of the eyelid, in order to enable the plasters or bandages to straighten with more facility the ciliary border. But it is evident that such accessories would only tend to complicate the operation, and that they will not be retained.

III. The only treatment in fact, therefore, that can be advantageous, when there exists no loss of substance, or organic alteration in the tissue of the skin itself, consists in astringents and caustics, or excision of the conjunctiva by the method of Bordenave. The only modification, perhaps, under such circumstances which might be proposed with advantage, would consist in cutting the flap (or fold) of the conjunctiva, in such manner that its anterior border might be made to approximate as near as possible to the free border of the lid, and then to unite the two lips of the wound by a few points of the simple suture. It is probable that we would by this means abridge the time of the cure, by avoiding the inequalities of an internal cicatrix.

B. *Ectropion from shortening* (raccourcissement) *of the skin*.—Bridles and cicatrices, which are sometimes left as the consequence of burns, wounds and ulcers of the face, frequently produce an ectropion much more difficult to destroy than the preceding. Desiccants and caustics applied upon the palpebral conjunctiva are then no longer of any use; and it would be fruitless to attempt to re-adjust the lids by means of threads or plasters. Cauterization with the red-hot iron, and excision of the relaxed surface itself, are usually insufficient. Many practitioners, even among the moderns, admit, that the disease may then be considered as incurable. It is in such cases especially, that blepharoplasty may be called into requisition. [See Vol. I., also our notes on this subject in that volume. T.]

I. *Method of Celsus*.—Up to the time of Boerhaave and Louis, an infinity of processes were practiced in order to elongate the external surface of the eyelid thus reversed. Some with Demosthenes of Marseilles, Celsus (Lib. VII., cap. 7.) and A. Paré, proposed to make upon the skin a semilunar incision, with its horns turned towards the opening of the eye; others confined themselves to a transverse incision, the lips of which they endeavored to keep apart, by filling the wound with lint or any other foreign body; others, like Paul of Egina, and Acrel, endeavored to destroy effectually all the bridles and cicatrices, either by making simple incisions upon them, excising them with the bistoury or scissors, or by strangulating them by means of a ligature. At present it is admitted, that these different operations, far from being advantageous, are almost always hurtful, and that in spite of every precaution, the wounds which result from them, shorten the integuments of the eyelid in place of favoring their elongation.

Though it be true that the ancient method of Celsus is frequently the most inefficient in cases of ectropion from alteration of the skin, it is, moreover, also true, that it may sometimes succeed. M. A. Petit (*Obs. Chir.*, p. 175, obs. 94.) gives a curious instance of it; there existed a breadth of scarcely three lines between the tarsal cartilage and the eyebrow; the conjunctiva was incised without any benefit; when the external semilunar incision, and in such manner as



to comprise only the skin, was then resorted to, and the lips of this incision kept apart by lint. The bottom of the wound by healing up (par dessication,) was transformed into a cicatrix of three lines in breadth, and the eyelid was thus enabled to cover the eye as in health. M. Malvani, (*Journ. Gén. de Méd.*, t. 108, p. 28,—or *Arch. Gén. de Méd.*, t. XXI., p. 273,) and Pellier de Quingsy, (*Obs. sur l'œil*, p. 502, obs. 201,) moreover, who relate facts borrowed from Daviel and Marchand, equally prove that this method does not deserve all the blame, which following the example of Herlse, who wrote in 1668, the moderns have generally reproached it with. It is, however, to be considered that it is exceedingly uncertain, and that it is scarcely worthy of being revived at the present day.

II. *Process of Antylus and M. Adams.*—In 1813, M. Adams, an English oculist, proposed for difficult cases a process which he supposed he had invented, but which M. Martin (*Thèse*, Paris,) attributes to Physick and M. Bouchet, and which is found in part described in Aetius, (*Serm.* 3, cap. 61, 62.) A triangular flap or V, whose base corresponds to the eyelashes, is cut out at the expense of the affected eyelid. The two sides of the division are then reunited by means of suture. The advice of M. Adams has been adopted in France by Bécларd, and especially by M. Roux. I have seen it employed, and often employed it myself successfully. Antylus (Peirylhe) who made his incisions from the adherent to the free border of the lids, was careful in dividing only the conjunctiva, tarsal cartilage and orbicularis muscle; of leaving, in a word, the skin intact, which manifestly distinguishes his process from that of the English surgeon. M. Adams and M. Roux first seize the eyelid with a ligature forceps, then cut on each side through its whole thickness, and in this manner circumscribe the triangle mentioned above, by commencing at its base. The blood which immediately runs out copiously, and which comes from the ciliary or palpebral artery, soon ceases of itself. To reunite, M. Adams restricts himself to a single point of suture placed very near the eyelashes. M. Roux proceeds precisely as in hare-lip, that is to say, that with one or two short, strong pins, or those little pins called minnikin pins, (camions) he constructs the twisted suture. In place of the bistoury, it would be as I think, more convenient to employ a good pair of scissors, as I have frequently done. The operation is then more prompt and certain, and the section of the tissues neater and incomparably more easy. Also, I cannot see that there would be any use in giving more than two or three lines breadth to the base of the flap to be cut out, or to prolong its extent beyond the tarsal cartilage.

III. *Process of M. Walther.*—In a patient in whom the ectropion occupied only the temporal half of the eye, M. Walther, (*Bulletin de Férussac*, t. XIII., p. 77,) after having extracted the eyelashes, seized with a forceps the outer extremity of the lower lid, which he divided through its entire thickness as far as the temple, then did the same for the upper lid, and removed the flap of soft parts thus circumscribed. The two lips of the wound approximated from above downwards, were kept in contact by two points of suture, and the patient recovered perfectly. This process, it is seen, is no other

than that of M. Adams, applied to the smaller angle of the eyelids, and cannot be applicable except in cases similar to that mentioned by M. Walther.

IV. *Process of M. Key*.—In 1826, M. Key had to treat an ectropion, which MM. Travers, Tyrrell and Green had vainly endeavored to cure by the ordinary methods. M. Key, supposing that the cause of the reversion of the lid in this man might have depended upon the spasmodic contraction of the orbicularis muscle, made a transverse incision in the skin, and penetrated little by little as far as to the convex side of the tarsal cartilage; directed an assistant to keep the two lips of the wound apart, and was then enabled to seize with the forceps a bridle of fleshy fibres, which he divided by means of a very sharp pair of scissors. The operation was attended with entire success. I do not know if practitioners will adopt the views of M. Key; I am not aware that they have been precisely stated; what is certain is, that we cannot well conceive of the existence of these supposed spasmodic contractions, nor how the excision of a portion of the orbicularis muscle of the eyelids can remedy ectropion; nevertheless, as in surgery especially, as soon as a fact is averred, whether it is comprehended or not, prudence recommends that it should be admitted, I have not thought it proper to pass by in silence the operation of the English surgeon.

V. *M. Brach*, (Kleinert's *Répert.*, Février, 1837, p. 22,) who proposes to circumscribe and then excise a quadrilateral flap of the integuments, and to have recourse afterwards to the suture, appears to me to have intended to speak of, or to propose an improvement for the treatment of entropion, rather than that of ectropion. The same remark I think may be made of M. Jacob, (*Dublin Hospital Reports*, vol. V., p. 390,) who imagines the operation may be rendered more sure, by confining ourselves to the division of the temporal angle of the eyelids.

VI. The process of M. Dieffenbach, (*Bulletin de Férussac*, tom. XXVI., p. 97,) consists in an incision on the base of the eyelid, with a view of penetrating in this manner to the internal surface of this organ, and to draw its conjunctiva with the convex border of the tarsal cartilage outside, in order to fix them by means of a suture in a fold of the skin. This, however, is an operation which it appears to me ought not to have the preference but in a very small number of cases, and which would expose to a deformity nearly as great as that of the ectropion itself.

VII. Should any of the processes of which I have hitherto spoken, not appear to be suitable, and should the shortening of the skin be considerable, we should have at our command the resources of blepharoplasty, such as I have described it in another part of this work. In such cases I think satisfactory results might be hoped for from the *method of Jones*, even more than from the modification proposed for blepharoplasty in general by M. Hysern of Madrid, (*De la Blepharoplastique temporo-faciale*, Madrid, 1834,) though this modification, which I had not an opportunity of speaking of at the proper time, and in favor of which the author relates two successful examples, is in other respects very ingenious. The method of Jones has the immense advantage of not substituting a deformity in place of

that which we wish to destroy, and of being easy of execution and devoid of serious dangers. I had suggested it in 1834, and I still believed myself the inventor of it in 1837, when I learnt that M. A. Bérard made a trial of it without success, and that M. Jones had employed it in two instances with advantage. M. Sanson, who, according to M. Carron du Villards, (*Maladies des Yeux*, t. I., p. 347,) had also employed it, had no reason to be satisfied with it, since his patient, who was soon seized with an erysipelas, ultimately died. Having finally put it in practice in 1838, I ascertained that it was in reality easy and more prompt than any other, and that we should be wrong in not giving it the preference in cases where all that would be required to adjust the eyelid would be to elongate the skin to the extent of some lines. The young man whom I operated upon in this manner, had had almost the entire left cheek destroyed by a carbunculous affection. The lower eyelid was thus depressed as far down as to a line with the suborbital foramen, and the inferior half of the eye thus remained entirely uncovered. Having cut and dissected the flap, I first united the apex of the wound, to the extent of six lines, by means of three points of suture. Three other points of suture outside, and as many on the inner side, afterwards approximated the sides of the flap and the borders of the solution of continuity that were still free. An erysipelas which made its appearance on the sixth day, did not prevent the agglutination of the parts from being accomplished, and the patient left the hospital at the end of a month with his eyelid raised up to the extent of four lines, though still a little reversed, and in such manner as not to touch the upper lid except under the influence of a very strong contraction of the orbicularis muscle. It would be necessary, moreover, in order to derive all the advantage possible from this operation, to prolong to a very considerable distance the incisions on the side of the base of the orbit, and to dissect the flap nearly as far as the root of the eyelashes, in order to separate its apex as much as possible from its point of departure. It would be moreover necessary to reunite the whole by numerous points of suture, and to endeavor to place in contact the borders of the wound to an extent of from four to ten lines below the point of the V, which moreover would be included by one of the threads or one of the pins. (See Blepharoplasty.) Should ectropion have been caused by any tumor whatever developed in the interior of the orbit, or in the substance of the eyelid itself, it is unnecessary to say that the surgeon should direct his attention to this tumor, and not to the reversed eyelid.

## § II.—*Blepharoptosis*.

When the upper eyelid is kept depressed to such degree as to completely conceal the eye, and without the eyelashes being turned inwards, whether such disease should depend upon the inaction of the levator muscle, or that it is owing to any other cause, if it is ancient, and has not yielded to antiphlogistic or exciting remedies, or to local or general pharmaceutical means, we are necessarily obliged to have recourse to the resources of surgery for this malady. The process ascribed to M. Hunt, (Carron du Villards, *Oper. cit.*, t. I.,



p. 254,) and which I have described above under the name of M. Brach, might in this case be useful. Having excised his elliptical or quadrilateral flap, the surgeon would attach the palpebral border to the superciliary border of the wound, and would thus place the movement of the eyelid under the influence of the occipito-frontalis muscle; we should be wrong, however, to put too much confidence in this remedy. The operation which the fall of the upper eyelid may require, and which is the same nearly as for entropion and trichiasis, has moreover considerably varied.

### § III.—*Trichiasis.*

Hippocrates passed two nooses of thread through the skin, one near the free border, the other towards the base of the eyelid, and knotted them together in order to turn the eyelashes outwards.

A. *Excision of the integuments.*—But it is to the excision of a transverse cutaneous flap, that attention has been more especially directed. Already carefully described by Celsus and G. de Salicet, this excision is performed in various ways. Acrel, who also proposes it, recommends that we should give a rhomboidal form to the flap. As it appeared to him that it would not always be attended with success, he suggested the idea of incising the integuments above the eyebrow, and to remove therefrom a segment of very considerable size. Celsus and Galen traced out with ink the limits of the flap to be removed, and afterwards reunited the wound by means of a single point of suture. Aëtius advises that one of the incisions, the superior, should be semilunar, and that the inferior should be straight. In place of one point of suture he employed five. Paul of Egina commenced by making upon the internal surface of the eyelid, behind the eyelashes, a transverse incision, extending from one angle of the eye to the other. This was associated with excision and three points of suture. L'Habitant, (*Annuaire d'Evreux.*—*Jour. de Med.*, 1806, t. XII., p. 368,) cured a patient in five days.

B. *Cauterization of the Skin.*—Rhazes had already endeavored to replace excision by means of caustics. Abul-Kasem made use of the hot iron or quick-lime. Costæus especially, and D. Scachi have eulogized the actual cautery. Ware incised before cauterizing. M. Héling (*Bulletin de Férussac*, t. II., art. 20) and M. Quadri have bestowed warm encomiums upon sulphuric acid. The professor of Naples commences by causing the eyelids to be gently separated apart and then washes, wipes and carefully dries them by means of a fine piece of linen or a sponge. He then, by means of a small bit of polished wood, applies the acid upon the skin which corresponds to the border of the tarsal cartilage, and this to the extent of four to six lines transversely; waits some seconds, in order that the first application of the acid may combine with the tissues; repeats it a second, third and even a fourth time, until the eyelid is slightly crisped outwardly, and he adopts moreover every precaution possible to prevent the caustic from penetrating to the eye.

The *excision and cauterization* of the skin, whether with sulphuric acid, or with potash, as M. Solera (*Bulletin de Férussac*, t. II., p. 417) prescribes, evidently produce the same final result. By both

methods there is a loss of substance. In order that cicatrization may be effected, the lips of the wound are obliged to approximate towards each other. The result is always a shortening of the eyelid and especially of its outer surface. After excision, to which moreover we should give a variable extent, according to the degree of retraction that we desire to produce, should we, after the manner of the first authors who have employed it, as De Beer and M. Langenbeck, have recourse to the simple or quilled (*emplumée*) suture, or should we, as Scarpa recommends, confine ourselves to a simple dressing and union by the second intention? This is a matter of choice, and not of necessity.

C. *Tearing out (arrachement) of the Eyelashes.*—One of the most ancient methods of treating trichiasis, and especially districhiasis, is the extraction of the deviated hairs, the first idea of which, according to Galen, is to be attributed to Popius. Nothing, in fact, seems more natural, in order to destroy the pain and inflammation which then exist in the front part of the eye, than to remove their cause. Unfortunately it is soon perceived that this remedy is only a palliative, and only relieves but for the moment; and that, in growing out again, the extirpated eyelashes almost constantly retake their morbid direction. Nevertheless it is almost the only operation approved by La Vauguyon, Maîtrejan, De La Motte, and even Richter, when the tarsus itself is not diseased. In order to protect ourselves from such an inconvenience, practitioners proposed to apply a caustic upon the root of the hairs which have been extracted. Sulphuric acid, butter of antimony and nitrate of silver have in turn been lauded for this purpose. If there are only two or three hairs that have deviated, then mere extraction by means of a tweezers (*épilatoire*) very frequently will be found quite sufficient. In repeating it as soon as the eyelashes reappear, we ultimately either destroy their root or change their direction. It is, moreover, an operation too simple, and which too constantly affords relief, not to be made trial of at the very beginning. I have employed it three times with complete and perfect success. Excision with the extraction of the eyelashes, as Forlenze advises, (*Annuaire d'Evreux*, 1810, p. 68,) could have no object.

D. *Cauterization of the Eyelashes.*—Perceiving that all these remedies might fail, some surgeons made trial of the actual cautery, after the advice of Rhazes. In our times, also, some practitioners have found no better method of remedying trichiasis than an improvement on the mode of cauterization employed by so many ancient authors, and especially by Celsus, who made use of a needle heated to a white heat. The form of cauteries formerly employed did not allow of carrying the caloric to a sufficient depth. That of M. Champesme (*Revue Méd.*, 1826) is terminated by a point which supports a large, smooth dilated ball which approximates it a little to the cautery called sparrow-head (*tête de moineau*). Heated to a white heat this point, though very small, maintains the heat sufficiently to form rapidly eschars on every part to which it is applied. M. Champesme asserts that he has seen trichiasis several times radically cured by his instrument; and we could not deny its advantages if, as A. Paré sustains, cauterization of the lashes ought to have the decided preference. M. Carron du Villards, (*Op. cit.*, t. I., p. 307,) plunging

in an insect pin to the depth of a line and a half, in following the direction of the lash in each bulb, afterwards unites together all the pins thus implanted, by means of a silver thread, and then seizes hold of them with a curling tongs (*fer à papillottes*) strongly heated. The process of Celsus, Paré, or of M. Champesme, is by this means rendered as simple as it is easy.

E. *Reversion of the Eyelashes outwards* (eversion).—A mode less severe, and which appears to have been attended with some success, consists in reversing the deviated eyelashes upon the skin of the eyelids. Heraclides, who passes for the inventor of it, kept them there, as did also Acton, by means of plasters. I have succeeded by this mode in a case which had resisted excision of the integuments. Celsus and Galen say that in their time some persons introduced through the skin by means of a needle, a woman's hair doubled in such manner as to enable it to entangle the deviated eyelashes in its noose. According to Rhazes, we succeed full as well by crisping (*frisant*) them with a hot iron.

#### § IV.—*Entropion.*

A. *Excision of the skin*, so strongly recommended by Bordenave, Louis and Scarpa, and almost all the moderns, as a remedy for entropion, is an operation too simple and one that too frequently succeeds not to be made trial of at first. The surgeon being placed in front of the patient, seizes with an ordinary forceps or with his fingers, or with the crutch forceps (*pince en béquille*) of Beer, a fold of the integuments sufficiently large to make the lashes turn upwards and forwards. If this fold should be too large, we should incur the risk of producing an ectropion; if not sufficiently so, we should only obtain an imperfect cure. It is to be excised moreover, in the same manner and with the same precautions as the protrusion of the conjunctiva in lagophthalmia or simple ectropion. After the operation, Scarpa recommends that the skin of the face for the lower eyelid, and that of the eyebrows and forehead on the contrary for the upper eyelid, should be pushed back towards the orbit, and maintained and gathered at this point by means of graduated compresses or adhesive plasters extended from the cheek bone to the forehead. "On the following day," he remarks, "the patient may open his eye, and if proud flesh or fungosities grow up at a subsequent period at the bottom of the wound, they are repressed by nitrate of silver. It is in such cases especially that Beer and M. Langenbeck consider that the suture ought to be employed, in order that the eye may cease as soon as possible from being fatigued by the presence of the lashes. As the skin divided is very thin and very pliant, and as nothing is more easy than to perforate it with a thread, and as there would moreover evidently be an advantage in immediate reunion without gathering the teguments together like Scarpa, on the side of the eye, I cannot see why we should refuse to make use of the simple suture, were it only for the space of twenty-four hours, as is recommended by M. Langenbeck.

B. Avenzoar speaks of practitioners who preferred compressing the flap of the *integuments between two splints*, and thus cause its morti-



fication, rather than to excise it with a cutting instrument. Bartisch has reproduced this idea under another form, by proposing to compress the skin between two plates of iron united by a hinge. Adanson, according to Heister, invented another method. By means of an instrument almost similar to that of Bartisch, and garnished with holes, he pinched up a large flap of skin, the base of which he traversed by passing threads through the apertures of the instrument, (pince,) then excised the upper border and left it to itself as well as the threads, which required to be knotted immediately, like so many ligatures.

C. *Excision of the Palpebral border.*—In obstinate cases, Dr. Schreger removes, by means of curved scissors, a triangular flap from the border of the eyelid, including in it the deviated eyelashes, and even goes, according to M. S. Cooper, to the extent of recommending the excision of the entire reversed portion of the tarsus; but we cannot see for what reason this process, already lauded by Heister and De Hayes-Gendron, ought to have the preference over simple excision of the palpebral integuments.

D. *Process of M. Crampton.*—M. Crampton, after having perpendicularly divided the free border of the eyelid to the right and left of the point which supports the deviated hairs, reunites the two vertical wounds which he has made, by a transverse incision of the conjunctiva, then brings the portion of the cartilage thus divided into its natural position, and maintains it there by means of adhesive plaster, or a suspensory to the eyelid. M. Travers, who partially adopts the views of M. Crampton, thinks that in certain cases it would be still better to excise the little flap of the tarsus. The physicians of Bimarestan, mentioned by Rhazes, and who, after having incised the cartilage, traversed it with a thread, in order to turn it outwards; Richter, who in obstinate entropion advises that we should make a transverse incision upon the tarsus, and Paul of Egina himself, who recommends that we should incise the eyelid transversely upon its deep-seated surface, are the sources, as we perceive, from whence M. Crampton obtained the idea of his process, which has again been recently attended with success in a case of ancient entropion, as employed by M. Mackenzie, (*Gaz. Méd.*, 1838, p. 775.) At all events, however, it is a remedy only to be made trial of as an exception in cases where all other means fail.

E. *Process of Guthrie.*—M. Guthrie also incises the tarsus near the ocular angles; but in such manner as to go a little beyond their convex border, afterwards he reverses it with the finger, either towards the forehead or face, according to the eyelid affected. If in falling upon the eye, the cartilage continues to turn inwards, M. Guthrie recommends that we should moreover divide it transversely, and that we should excise a portion of it at the same time with the skin which covers its external surface. Without being important or meriting any great degree of confidence, this process, nevertheless, appears to be less objectionable than the preceding.

F. *Process of Saunders.*—The most sure mode, says Saunders, is to remove almost the entire diseased organ. A thin plate of lead or silver curved like the eyelid, being previously introduced between this curtain and the eye, the operator causes the parts to be stretched;

divides the skin and the orbicularis muscle, behind the eyelashes, a little beyond and in the direction of the tarsus, dissects the flap and terminates by the extirpation of the cartilage. The inconveniences of such a method are too evident to make it necessary for me to expose them. There would be more advantage in following the advice given by M. Jaeger, then by M. Flarer, to excise the cutaneous portion of the free border of the eyelid, respecting its ocular portion, while at the same time removing the deviated eyelashes and their roots.

G. *Process of Vacca*, (*Journ. de Progrès*, t. III., p. 273; *Bull. de Férussac*, t. VII., p. 361.)—The conduct of Vacca appears to me to be much more reasonable. In one of the most obstinate cases of trichiasis, this surgeon proposed to lay the roots of the eyelashes bare, and to destroy them, either by means of a cutting instrument or nitric acid. A concave thin plate, having a transverse groove on its convex surface, is first placed in front of the globe of the eye. An assistant stretches the eyelid and keeps the border confined in the groove of the plate. By means of two vertical incisions of a line long united by a transverse incision, and comprising only the skin, the operator cuts out a little parallelogram, which he reverses to wards the side of the palpebral opening, thus lays bare the cartilage, seeks the bulbs of the diseased eyelashes with a forceps, excises them with scissors and burns them, replaces the flap, and makes use of plasters, not the suture, to keep the wound united. The numerous branches, furnished by the palpebral artery to the eyelashes, are cut and bleed freely. Nevertheless, the hemorrhage is never troublesome, and always stops of its own accord.

Delpach, who also eulogizes cauterization of the eyelashes, not of their root, (tête,) but of their neck, counts chiefly on the establishment of an elastic cicatrix, or an inodular tissue, and consequently prefers union by the second intention. Besides the processes already described under the head of trichiasis, viz. excision of a fold of the skin, eulogized also by Dionis, Saint-Yves, Janin and Gleize, or the the red hot iron, also recently lauded by M. Jobert, entropion has been attacked by the process of Guérin, that of M. Gensoul and that of M. Segond.

H. *Guérin*, (*Journ. de Montp.*, t. II., p. 281; Carrondu Villards, t. I., p. 314,) attributing the disease, without doubt, to a spasmodic contraction of the fibres of the orbicularis muscle of the eyelids, proposed to slit perpendicularly to the extent of several lines, the free, from the adherent border of the eyelid. It is said that Physick, Béclard, and M. Bouchet also had recourse to this method for entropion. We thus produce a coloboma, or a sort of hare-lip of the eyelid, which gives momentary relief, but which cannot effect a definitive cure but at the expense of a very disagreeable deformity. It is consequently a method which should be rejected.

I. The process attributed to *M. Gensoul* (Carron du Villards, t. I., p. 315, 326, *Gaz. Méd.*, 1832, p. 568,) would be less objectionable. In place of a transverse fold, this surgeon excises a vertical fold of the teguments of the eyelid. In the process of M. Segond, (*Revue Médicale*, 1836,) there is excised successively a vertical and a transverse fold of the skin, so as to unite the ancient method to the process of

the surgeon of Lyons. I do not doubt that we may succeed in this manner in curing entropion in a number of cases; but I scarcely understand the necessity of this species of crucial incision devised by M. Segond and extolled by M. Carron du Villards. An examination of a great number of cases of reversion of the eyelids also has never enabled me to comprehend the utility of the processes of Saunders, Crampton, Flarer, &c., the excision in the manner of Bordenave always having succeeded and appeared to answer with me.

*J. Process of the author.*—To render excision as simple and effectual as possible, whether by the ancient method or the method of M. Gensoul, I adopt the following process: If the palpebral border is reversed inwards, rather towards its extremities than middle portion, I prefer the excision of a vertical fold; in the contrary case I adopt excision of the transverse fold. In the first case I take care that the wound is larger at its lower part than above, and that it represents a sort of oval. In the second case I incise as near as possible to the ciliary border, and I am guarded in giving to the flap a breadth so much the greater at its middle, in proportion as the middle third of the eyelid is found more completely deviated inwards. By means of these precautions, the approximation of the borders of the wound is effected entirely at the expense of the reversion of the eyelashes, and the least loss of substance of the skin produces a decided effect upon the entropion. When, after excision of the integuments, we leave the wound to cicatrize by second intention, the cure may be long and incomplete. To confine ourselves to the employment of adhesive plaster, to approximate the sides of the wound, is very uncertain, and the blood or the tears, which flow in abundance, render the application of the suture quite difficult. These difficulties all disappear by my method, which may be adopted by any body. Having raised up, with the fingers or a good pair of forceps, the vertical or transverse fold to be excised, I immediately traverse its base with a needle, first at the middle and then at each extremity, in order to leave there three threads, each a foot long. I then excise this fold at a line in advance of the threads, and there remains nothing more for me to do than to tie them into a knot, in order to complete the suture and accurately unite the wound. In this manner we avoid all embarrassment caused by the blood; besides that it is infinitely less difficult to traverse the tissues, and that we cause less pain to the patients than if it were necessary to pass successively afterwards the threads through the two lips of the wound. This process, made trial of already in ten to twelve patients, either at the hospital of La Charité or in private practice, has appeared to me to be of such great simplicity, that I have no longer felt it necessary to make use of any other.

*K. Appreciation.*—In simple blepharoptosis excision of the integuments is almost always followed by success. It is also the most effectual remedy for ordinary entropion. If it were a paralysis of the levator muscle, we should have recourse to the process of M. Brach. In trichiasis and entropion, extirpation, extraction and reversion of the eyelashes, in the manner of Heraclides, when their length permits it, or even the process of Hippocrates, might be first made trial of. Then come, 1st. Excision of the integuments, which,



as Physick recommends, ought to be made very near the palpebral border. 2d. Cauterization of the skin by the method of Helling, M. Quadri, M. Solera, or M. Carron, which I have tried in three instances with success. 3d. Process of Vacca for the most severe cases. And, finally, 4th. The excision of the cartilage, according to the views of M. Guthrie, Schreger, M. Travers, Saunders, and M. Crampton, or even by the process of M. Adams, if no other could succeed.

### § V.—*Tumors of the Eyelids.*

If the tumor which occupies either one of the eyelids has not disorganized this curtain but only deformed it, we must destroy it without encroaching on the natural organ.

A. *Encysted tumors* come under this class; being a sort of hydatid productions or sebaceous cysts or degenerate mucipares, they scarcely ever disappear by resolution.

I. *Extirpation*.—When the vinous solution of muriate of ammonia, recommended by Morgagni as well as by Boyer do not succeed, we ought, if the patient is disposed to be relieved propose the operation properly so called. In these cases the ligature, incision, cauterization, and extirpation have been recommended. The ligature has been long since, and very properly, abandoned. Cauterization is equally rejected, unless it should be combined with incision. A needle fixed like a seton in the substance of the tumor, as recommended after a case or two by Demours, (*Arch. Gén. de Méd.*, t. XVI. p. 107,) and by M. Jacquemin, would not in my opinion succeed except by chance. So that it is to extirpation that attention has been more especially directed. In order to perform it, it is altogether useless previously to pass a thread through the tumor whether laid bare or not, as Bartisch proposes, in order to act upon it with more certainty. When it is small and appears to have its seat nearer to the conjunctiva than to the skin, we must seek for it upon the internal surface of the eyelid, because the operation then does not oblige us to go through the tarsal cartilage. The greater projection that it makes externally even ought not always to deter us, for this prominence depends much more upon the pressure of the globe of the eye than upon the precise seat of the tumor. When the skin is changed and very much attenuated, when it is attended with too much difficulty to reverse the eyelid, or when the tumor exists outside the tarsal cartilage, we are then under the necessity of dividing the integuments.

a. *First Process*.—With the thumb placed on the inner side of the tarsus and the forefinger applied upon the skin, the surgeon seizes the diseased lid; reverses it outwardly; presses upon the tumor with his finger in order to make it project in front of his thumb; lays it bare by means of a transverse incision; seizes it with an erigne, which is taken charge of by an assistant; then immediately resumes the bistoury, dissects the tumor, and isolates it in such a manner as to leave nothing of the cyst behind. The little wound which results from this operation requires no particular care, and the cicatrization is effected in the course of a few days. We might also, as soon as the tumor is secured with a hook, and when it has but little volume

and may be readily raised up, excise it with one cut of the scissors curved flatwise. Nevertheless it is important to respect the conjunctiva and subjacent tissues, and to incise rather than excise them, seeing that their destruction would expose to the danger of entropion.

*b. Second Process.*—When from necessity or choice we wish to attack the cyst through the skin, the forefinger takes the place of the thumb, and vice versa. In pushing the tumor the finger stretches the whole eyelid, protects the eye and answers a better purpose than the little cup of lead or silver formerly used, or the plate of gold or leather still recommended by Chopart and Desault. We afterwards divide the integuments cautiously, in order not to open into the morbid body. As for the rest there is nothing particular, and the cure is rarely protracted beyond from three to four days, and without the necessity of dressing.

*c.* In both cases we ought to be on our guard against perforating the eyelid, and as much as possible of wounding the tarsal cartilage, because the cure would in most cases be thereby retarded, and that there might perhaps result from it a sort of fistula or some other deformity. A good pair of forceps may advantageously be substituted for the fingers in most cases. Two forceps, one on each side confided to an assistant, gives still greater facility in stretching the eyelid while the surgeon dissects and removes the tumor. If the operator is sure of his hand, he may moreover himself fix the eyelid upon the globe of the eye by means of his thumb and left forefinger, while with the bistoury in his right hand he makes the division of the skin. Having secured the cyst with an erigne he isolates it, and afterwards separates it without danger. A plate of horn or shell glided between the eye and the eyelid, and which allows of the ciliary border being fixed on the transverse groove which exists on its anterior surface, by means of the nail of the left thumb, gives still greater security and freedom. A man from the country who had in each upper eyelid a fibrous tumor as large as a duck's egg, was cured by M. Fleury, (*Bull. de la Fac. de Méd.*, 1807, No. 2, p. 16.) who, removing an ellipse of the integuments together with the tumor, effected a cure without interfering with the movements of the eyelid.

*II. Modified Cauterization.*—Maitrejan, Heuerman, Nuck, and Loyseau, (*Observat. Chir. &c.*, p. 112, 1617,) before them commenced by largely opening the tumor in order to empty it, and afterwards to cauterize its interior. Chopart and Desault, who profess the same doctrine, use for the second stage of their operation the crayon of nitrate of silver. In adopting this method, Dupuytren gives as the reason that it is more easy, and in every respect as certain as any other, that it ensures us against the danger of perforating the eyelid, and that it is the only one that can be undertaken, when in spite of every precaution, we have penetrated into the cyst while endeavoring to lay it bare. Nothing is more easy than the manual. The organ is seized in the same manner as in the preceding case. With one stroke of the bistoury we divide the skin and small sac, which we empty, or is emptied immediately. With a crayon of nitrate of silver, directed with a certain degree of force upon the bottom of the wound, we cauterize its entire surface. The heterogeneous (coque) mass soon exfoliates, and the wound afterwards heals

up very rapidly. All other things being equal, excision is preferable; but the process of Dupuytren is almost equally as good, and will be found applicable in intractable subjects. Only it is important that the whole cavity of the cyst should be accurately and very strongly touched by the caustic; it is probably from the want of this precaution that a return of the disease took place in the three patients mentioned to me by M. Champion. I have, moreover, employed both modes with like success.

B. The *Chalazion*, the *Grelon* and *Grando*, which are so often confounded with palpebral cysts, are on the contrary small concrete tumors, occasionally fibrous, sometimes as it were caseous or tuberculous, and at other times of a fungous or mucous aspect. Under this last form they often show themselves near the conjunctiva, where I am in the habit of excising them, and afterwards cauterizing their root. It is evident that incision and cauterization would not be applicable to the others, and that extirpation is the only resource which can succeed with them. Like M. Champion, I have observed that many of these tumors have no cysts, and that in order to remove them, we are obliged to dissect them, as for example, we dissect tumors of the breast. I will remark that this small operation is quite painful, and that in certain patients it causes a manifest tendency to syncope.

C. *Erectile Tumors*.—The eyelids are subject also to other tumors. I have elsewhere given examples of the *erectile tumors* which are found here. I will add here that a tumor of this species which occupied the great angle of the eye, disappeared under the action of a compressing bandage and topical astringents, as proposed by M. Carron du Villards, (*Malad. des Yeux*, t. I., p. 353.) Caustic potash appears also to have obtained a remarkable cure of this kind (*Ibid.*, p. 355) with the same practitioner, who also asserts that the hot iron proved very efficacious in the hands of M. Jules Cloquet. It would appear that it is to his father to whom we are indebted for the treatment of erectile tumors by vaccination, and that a tumor of this kind which was situated upon the right eyebrow, was cured in this manner by himself in 1822.

D. *Cancerous Tumors*.—Experience has sufficiently proved that cauterization is an objectionable mode for destroying cancerous tubercles of the eyelids. Though even it should be a tumor of a less alarming nature, it is still with the cutting instrument that we ought to attack it, so often as the degenerescence has extended to the natural tissues. In this part, as in other regions, it is much better to do nothing than to leave a portion of the disease behind and not to trench into the sound parts.

I. When there exists only a *simple tubercle* accurately circumscribed, should it actually occupy only the border of the tarsus, we must isolate it by two incisions united in a V, remove it at the same time with the triangular flap which includes it, and have recourse to the twisted suture to unite the wound by first intention. If the alteration extends more in breadth than in depth; if after its extirpation we are of opinion that we cannot approximate the borders of the wound, we excise the tumor by a semilunar incision more or less elongated, or to a greater or less depth, either with a very sharp bis-



toury, or as M. Richerand prefers, with curved scissors, doing everything in our power not to wound the puncta or the lachrymal ducts. The solution of continuity cicatrizes by second intention. Gradually the integuments approximate to the eye, and ultimately form a border which replaces *in part* the eyelid which has been destroyed.

II. Cancerous degenerations show themselves, moreover, in the eyelids, as upon all other regions of the body under various forms. It does not follow, as has been supposed, because the cancerous tumor has extended as far as the conjunctiva, that its extirpation becomes impossible, or that we are prevented from having recourse to this remedy. M. Champion, who ventured to remove a large cancerous plate, and to perforate through and through the diseased eyelid, nevertheless succeeded perfectly in the case which he has communicated to me.

III. Again, the free border of the eyelid affected with *tylosis* is often transformed into a thick *bourrelet*, which in ulcerating soon assumes the aspect of cancer. But this kind of granulous and ulcerated border, which many practitioners who denominate it *noli me tangere*, prefer attacking by general medications rather than by active topical means, is in general very readily removed under the action of cauterization, by means of nitrate acid of mercury. Having reversed the diseased eyelid outwards and protected the globe of the eye by the usual means, I carefully touch all the ulcerated surface, and even the edges of the degenerated border with a piece of lint, slightly imbued with the caustic. These applications, renewed every four or five days, for three weeks or a month, transform the cancerous into a simple ulcer, and effect such a reduction in the surrounding tissues, that the wound soon cicatrizes and permits the eyelid to recover almost all its pliancy. I have, in this manner, cured a number of persons whom other practitioners had refused to treat otherwise than by extirpation of the eyelid, and it is a method which I cannot too much recommend.

IV. If the case should be one of a cancerous plate, of less thickness than breadth, and which did not extend to the free border of the eyelid, cauterization with the same acid or with the Vienna powder, or better still with the zinc paste, would be preferable to the knife; upon the condition, however, that upon the eyelids themselves, there were no other than the teguments yet altered, and that these different caustics should be applied in such manner as to not compromise the globe of the eye. I have often applied with entire success to cancerous ulcers at the inner extremity of the upper or lower eyelid, or solely and simply at the grand angle of the eye, a plate or thick piece of zinc paste, according as it appeared desirable to cauterize superficially or deeply, and I am of opinion that this caustic ought to be substituted for the bistoury whenever the cancerous ulcer, plate or tumor do not present well defined limits.

#### § VI.—*Ankyloblepharon, Symblepharon.*

A. The *adhesions* which the *eyelids* contract *with the eye* have been observed at every epoch. In order to destroy them, Heraclides, who employed the bistoury, lays down as a precept, that we

should incline the edge of the instrument rather towards the skin than towards the eye, and in order to prevent the reproduction of the adhesion should charge the patient frequently to move the organ of vision in every direction. When they are slight or but little extended, it is sometimes practicable, as Alix says, to tear them out by means of a sound or probe. If they show themselves under the aspect of bridles or lamellæ, and we can succeed in gliding under them, upon the globe of the eye, the blade of a canulated sound, we may, according to the direction of Maitrejan and Boyer, divide them upon this instrument without any danger. It is never allowable at the present day, to raise up the eyelid by means of a thread while we are dissecting it, as was the practice in the time of Bartisch. Moreover, the important point is not the division of these adhesions, but to prevent their reproduction. The movements of the eye, recommended by Heraclides, the plates of lead, gold, or leather, which Solingen and others recommend to keep between the eye and its connections, rarely attain the object in view. The porcelain or glass eye recommended by Demours, and the plate of softened ivory preferred by M. Carron, (*Oper. cit.*, t. I., p. 264,) are scarcely any better; inflammation soon renders the presence of such foreign bodies insupportable. The most prudent course is to restrict ourselves to passing, from time to time, a ring or the head of a large pin between the contiguous surfaces, in order that they may cicatrize separately. It is an operation after all, which, whatever M. A. Severin (*Med. Effic.*, part II., chap. 55, p. 215,) may say of it, ought not to be attempted, except in patients whose transparent cornea has continued unaffected and unchanged, at least opposite to the pupil. The case mentioned by this physician, who was operated upon twice by A. Petit and Dussausoy, (*Obs. Clin.*, art. 13, p. 181,) and afterwards by a charlatan, shows all the danger to be apprehended from an opposite course. Perhaps, however, we should then succeed if, after having slit up the eyelid vertically, as Guérin advises, (*Soc. Méd. de Montpellier*, t. II., p. 285,) we should keep its flaps reversed up to the period of the cicatrization of the bridles, and afterwards reunite them by suture.

B. Congenital or accidental union of the palpebral borders, always a less serious affection, may be complete or incomplete, and may exist alone or at the same time with the preceding infirmity. In the first case, in place of acting with the bistoury from before backwards, as the ancients did, upon the whole extent of the line which the natural division ought to occupy, we first make a small opening near the temple, in order to introduce afterwards, through this incision, a canulated silver sound, which is a little concave on its back, in order that it may accommodate itself to the convexity of the eye. The bistoury, guided by this director, would pass without danger from one palpebral commissure to the other in following the interline of the eyelashes. In the second case the preparatory incision is not necessary. We insert the sound through the remains of the ancient opening, as was successfully done by Hévin, (*Pathol. et Therap.*, t. II., p. 135.) In a patient operated on successfully by Quesnault, (Lelong, *Thèse*, No. 179, Paris, 1819,) there existed at the angle of the eyelids a small opening, which partially allowed of vision through

it. An opening existed also in the cases cited by Botin and Seiler, (Carron, *Oper. cit.*, t. I., p. 257.) Of the three brothers operated on in this manner by G. Lagr  e, (*Anc. Journal de M  d.*, 1760, t. XII., p. 157,) one died on the eighth day from marasmus. After having separated the eyelids, if ankyloblepharon should have coexisted with the disease, we must proceed to its destruction according to the rules indicated above. In the place of the bistoury conducted upon a sound, it would be practicable to employ scissors bearing a ball of wax, as J. Fabricius recommends, or a small button at the extremity of one of its blades, according to the recommendation of Scultetus. But it would be trifling to pass a noose of brass wire furnished with knots behind the abnormal agglutination (*soudure*), as Duddell did, and to approximate its two halves with the view of gradually dividing the bridge.

Finally, no one at the present day would be so absurd as to imitate F. de Hilden, by knotting the two ends of this noose and attaching weights to it in order to drag it by degrees to the outside. Inasmuch as after every process the disunited borders retain, after the operation, a great tendency to become re-agglutinated, the surgeon should not neglect to place between them, near the commissures, some strands of lint imbued with cerate, nor frequently to separate them apart by means of a metallic stem or ring. To dissect the conjunctiva in order to unite it afterwards with the skin by means of a suture, as M. Ammon recommends, would often fail and presents too many difficulties. Three points of simple suture on each lip of the wound near the commissure, would better attain our object and would cause infinitely less embarrassment.

C. Simple *phymosis*, or contraction (*r  tr  cissement*) of the eyelids, should be treated like ankyloblepharon, and requires no other details.

####   VII.—*Tumors.—Folds at the Great Angle of the Eye.*

Two kinds of tumors, disconnected with the lachrymal passages, have been noticed in the great angle of the eye: one having the *caruncula lachrymalis* for their seat, the other placed between the integuments and the direct tendon. I know but one fact of this last kind, and which belongs to M. Besson. The tumor, which existed on both sides, had the size and form of an almond: it was extirpated, and the patient got well.

A. The other kind is known under the name of *encanthis*. It has been noticed by a great number of practitioners, and I myself recently met with an example of it in the month of December, 1837, in a young girl of six years of age. The disease may in these cases assume the character of different kinds of tumors, whether fibrous or cancerous; in general, however, it presents itself under the aspect of a small reddish granulated mass, slightly painful, and which seems to prolong itself to a greater or less distance in the orbit, and which also protrudes more or less between the eyelids near the inner commissure. *Encanthis*, unless it should be attacked at the beginning, yields neither to debilitating or resolvent means. The ligature, employed in one instance by Purmann, would be suitable only to pediculated *encanthis*. It will be by means of *caustics* or the bistoury that we shall succeed. Among the first there are scarcely any other



than the nitrate of silver or the nitrate of mercury, which can be applied with safety. Potash, the butter of antimony, and the zinc paste, would in fact expose to too much danger of injuring the lachrymal sac or the nasal extremity of the eyelids. *Extirpation* of the tumor is in itself an operation sufficiently delicate, inasmuch as it would be easy to wound either the puncta, the lachrymal ducts, the muscle of Horner, the tendon of the orbicularis muscle, or in fine the outer wall of the lachrymal sac. The patient ought to be laid on a bed of sufficient height, or seated on a chair; an assistant placed behind steadies the head and attends to keeping the eyelids separate. The surgeon, securing the tumor with an erigne, which he immediately consigns to a second assistant, isolates, by means of a straight bistoury, the morbid mass, first below, then above, then inwardly, in order finally to dissect it from behind forwards, and from within outwards, avoiding with care the globe of the eye. M. Fleury (*Bull. de la Fac. de Méd.*, 1806, p. 157, or 1807, No. 2, 3 année, p. 16,) has extirpated two of them which were of the size of a large egg, but they were situated upon the upper eyelid and not at the angle of the eye. M. Carron du Villards, (*Malad. des Yeux*, etc., t. I., p. 462,) who says that he has twice performed the operation of removing encanthis, perceiving that in one case it was a fungus and in the other a melanotic tumor, considered it necessary to touch the bottom of the wound with the button cautery in his first patient, and with caustic potash in the second. The palpebral artery, which is ordinarily divided by this operation, sometimes gives rise to a kind of hemorrhage which is quite abundant, but which simple tamponing generally arrests without any difficulty. The wound is then filled with small balls of lint, after which a fine piece of linen perforated with holes and imbued with cerate, and then a plumasseau of lint, are placed above to cover the great angle. After this nothing more is required to keep on the dressing than to envelope the whole with a compress and a few turns of bandage in the form of the monocle. After the first dressing we reduce every day the size or the number of the small balls of lint, and the wound generally cicatrizes in the space of from fifteen to twenty days. It was in this manner that M. Marchettis succeeded in detaching a meliceromatous tumor which extended over even a part of the transparent cornea, but he had recourse to the scissors to terminate his operation.

B. *Epicanthis*.—Should the fold of integuments, which from the root of the nose sometimes advances forward in the form of a crescent upon each side, as if for the purpose of covering the caruncula lachrymalis, have too great an extension, patients might readily be relieved by means of an operation which MM. Ammon and Carron, who designate this deformity under the name *epicanthis*, have frequently employed with success. Raising up the skin at the root of the nose, a vertical elliptical flap is excised, of such dimensions that the approximation of the lips of the wound by suture will immediately cause the disappearance of the two angular crescents. If before excising it we should pass pins or threads through the base of the cutaneous fold, the operation would be still more simple.

[Mr. Dalrymple, a surgeon of London, (*Cormack's Journ.*, October, 1843, p. 952,) has had occasion to remove from the upper eyelid an

encysted tumor about the size of a pea, composed of closely agglutinated epithelial scales, containing granular earthy molecules, instead of being composed as is usual of thin transparent laminæ, with a central nucleus. T.]

#### ARTICLE IV.—ORBITAR CAVITY.

*Loupes*, encephaloid masses, aneurisms, exostoses, &c., may be developed in the interior of the orbit. *The lachrymal gland* itself sometimes acquires a considerable volume in passing into the condition of schirrhus. These different lesions, whose especial peculiarity is to push the eye forwards, and at the same time to incline it towards the point opposite to that at which they are situated, have often given occasion for its extirpation. Nevertheless, so long as the globe is not itself implicated in the degeneration it may be saved. This is indisputably demonstrated by an elegant operation of Acrel, the case related by M. Cantoni, (*Journal des Progrès*, t. XIII., p. 256,) that of M. Gerdy, (*Archiv. Gén. de Méd.*, t. VIII., p. 339, 2e série.) and the practice of Dupuytren, (*Clin. des Hopit.*, t. III., p. 196.) An ancient memoir of Daviel and Guérin of Bordeaux proves, on the other hand, that the lachrymal gland has often been extirpated with success by those two surgeons. M. D. Lasserre (*Cas de Chirurg.*, &c., p. 52, fig. 15,) has extirpated from the orbit of a woman a cyst which strongly protruded the eye outward, and the interior of which was cribbled with hairs. Even osseous tumors may be removed without injuring the eye, either by the chisel and mallet, or by tractions or well-directed movements, as is proved by the case related by M. Sultzer. The rules to be followed for extirpation, either of the lachrymal gland or of any other tumor situated in the orbit, will have necessarily to vary according to the volume, form, nature and seat of the disease. If, for example, it was only a cyst filled with matters more or less liquid, nothing more might be required than to plunge a bistoury into it, and to keep its cavity open by means of a meche of lint. MM. Schmidt and Rutdhoffler, in fact, who have often met with cases of this kind, consider that puncture with a trochar would be sufficient. Ware (*Mal. des Yeux*, p. 188, 1805,) cured his patient of a serous cyst, which he had in the orbit, by means of sixty-three punctures. Guérin of Bordeaux, supposing that he was to extirpate the lachrymal gland or a cancer, perceived, after he had passed through the eyelid, that he had fallen upon a tumor filled with semi-liquid matters; he opened and emptied it, and introduced a tent into it, after which the cyst exfoliated on the twenty-first day. Spry, who fell into the same error in 1755, would have probably preserved the sight of his patient if, instead of going on to extirpate the eye, he had had the prudence of Guérin. The liquid humors mentioned by St. Yves, (*Mal. des Yeux*, p. 188, 1805,) Pellier, (*Obs. sur l'Œil*, &c., p. 40,) and M. Graefe, (*Archiv. Gén. de Méd.*, t. VIII., 2 série,) the collection of hydatids described by M. Lawrence, (S. Cooper, *Dict. de Chir.*, &c.,) and M. Travers, (*Synopsis*, &c., p. 229, 235, 1821,) the meliceroma, steatoma, glairy cysts, and purulent collections, indicated by St. Yves (*Oper. cit.*) and MM. Lawrence, Richerand, Guthrie, (*Mal. des Yeux*, p. 147, 148,)

and Travers, (*Oper. cit.*, p. 229,) are to be treated in the same manner.

## § II.

In respect to *solid tumors*, there are two modes of removing them. Whether they are osseous or osteo-fibrous tumors, as in the cases of Baillie, MM. A. Cooper, Crampton, (Mackenzie, p. 56,) and Travers (*Loc. cit.*) fibrous, adipose, or cartilaginous tumors, like those mentioned by M. Mackenzie, (*Ibid.*;) or even exostoses, properly so called, examples of which are given by Sue, J. L. Petit, (*Mal. des Os*, t. II., p. 303,) and Brossaut, (Mackenzie, *Op. cit.*, p. 48, 1830,) they are notwithstanding to be extirpated.

A. *Process of Acrel.*—The whole thickness of the eyelids is to be divided in the natural direction of their curvature, near their root, and upon the point corresponding to the most prominent part of the tumor. An assistant then separates apart the lips of the wound. The surgeon, by means of a narrow bistoury, guided by the forefinger of one of his hands, isolates the tumor from the orbit, secures it with an erigne, dissects its inner surface, in order to separate it from the eye, either by the finger or the cutting instrument, and makes an effort to remove it from its apex to its base. It was in this manner that Daviel and Guérin proceeded, and none of their patients died. Although in one of their cases the tumor had, on its inner side, a groove adapted to the optic nerve, and that in another there supervened an enormous tumefaction of the eyelids with severe fever, all preserved their faculty of vision. It might at first have been doubted if the lachrymal gland itself had actually been extracted; but Guérin dissected it after the operation, and made even a model of it in plaster; the original of which, preserved by him in alcohol, he exhibited to the Academy of Surgery. It is moreover an operation which, at the present day, is perfectly well understood. MM. Todd, Lawrence and O'Beirne have performed it in England with no less success than Daviel, Guérin and M. Duval in France. The treatise of M. Mackenzie gives two other instances of it, and Warner, as well as M. Travers, had already had recourse to it. I have seen a woman in whom M. J. Cloquet performed this operation, so effectually that there was no longer any flow of tears on this side.

B. *Process of the Author.*—In my view, we could attain our object better than by the process of Acrel, if we were to commence by prolonging the external commissure towards the temple in such manner as to be able to reverse the eyelids. Different trials have satisfied me that by acting in this manner we may readily lay bare the two outer thirds of the orbital circumference. This being done, the surgeon separates the tumor he is about to remove from the osseous cavity which contains it, by dividing the cellular tissue from its external surface; dissects it down to its greatest depth, isolates it with every possible precaution, either from the muscles, optic nerve, or globe of the eye itself, and draws it to the outside by means of the finger or an erigne. For more facility, it would be well perhaps to circumscribe it also by a semilunar incision on the side towards the transparent cornea.

It must undoubtedly have been through inadvertence that an ob-



jection has been made to this process of incurring too great a risk of wounding the ducts of the lachrymal gland, (*Archiv. Gén. de Méd.*, t. VIII., p. 354, 2e série;) for if they required the attention, this process would enable us to respect them still better than that which consists in penetrating into the orbit through the upper eyelid.

C. *Sequelæ*.—After the operation there sometimes succeeds such an extensive swelling that it is not unusual to see the eye at the end of three or four days make as striking a projection as it did before. But this condition of things soon subsides. In the space of from ten to thirty days everything returns to its normal condition, and the cure usually takes place. Immediate reunion ought not be attempted in either process, since the cavity which is left in the orbit, cannot immediately be filled up, and that the tissues, lacerated rather than divided, are obliged to suppurate. In a patient whose wound closed up too rapidly, Guérin saw supervene symptoms so formidable that he found himself obliged to break the cicatrix with a sound. All that is necessary then, is to dress with a meche or tent imbued with cerate, to approximate the wound at the palpebral angle, if it has been found necessary to divide it, and to cover the whole with plumasseaux, and then by some compresses, which are kept in place by the bandage called the monocle. When the suppuration is established the dressing should be renewed every day. Injections often become necessary, and we do all in our power to enable the solution of continuity to close up from the bottom to the exterior. If by traversing the eyelids we should render the operation more easy, even though the deformity which it involves would necessarily have to be greater, we ought to give the preference to this manner of proceeding; but unless the tumor should have acquired an enormous volume this is not the case. The incision of the outer palpebral angle will always enable us to procure a sufficient degree of separation, even though there should have been alteration of the bones, to enable us to remove the tumor as well as the necrosed splinters, as was the case in one of the patients of Guérin. In a case of M. Hope, the tumor, which had existed for seven years, had so elongated the optic nerve, that it became necessary to push back the eye with the hand, and to keep it fixed there by means of a bandage; the cure, nevertheless, was complete. In a young woman whose indocility was uncontrollable, M. Wardrop bled her to the amount of fifty ounces of blood, in order to produce syncope, which enabled him to perform the operation with so much ease and success, that the patient coming to herself, could scarcely believe it. In a case of pancreatoid sarcoma mentioned by Bouttate of Moscow, (Abernethy, *Mémoires de Chir. étrang.*, t. II., p. 453,) the tumor, which was seven inches in length, and three and a half in circumference, weighed two pounds and a half. It was intimately united with the conjunctiva, which it pressed upon; but it was not difficult to isolate its base from the cornea, which had preserved its transparency. After the ablation, the patient recovered his sight.

## ARTICLE V.—GLOBE OF THE EYE.

§ I.—*Foreign Bodies.*

Numerous and various kinds of foreign bodies may become fixed on the eyelids or on the front part of the eye, in the same way as between the eyelids and the eye. Besides the ordinary signs which reveal their existence, I have ascertained, like Andrieu, (*Avis. au Citoyens, &c.*, p. 19, 1780,) that pungent and fixed pain corresponding to the middle of the upper eyelid, indicates the presence of a foreign body upon the cornea; in the same manner as those which are concealed in the oculo-palpebral fold of the conjunctiva, are announced by a dull pain, which corresponds to the upper border of the tarsal cartilage.

A. The *ciliary border* of the eyelids is sometimes invaded by insects. A young peasant girl who had this part of the coverings of the eye transformed into a brownish colored border, and who suffered from it to a considerable degree, carried there so great a number of pediculi pubis that M. Champion, who was then consulted, could have never believed it possible that so many of them could have attached themselves upon so narrow a space. In such cases, all that is necessary is, to cause the parts to be rubbed with mercurial ointment, that of white precipitate, or the pomade of Desault, and no operation is to be attempted. There have been seen, moreover, different sorts of worms either in the ulcerated border of an eyelid, or at the bottom of the oculo-palpebral groove. We have already an example of this kind in the *Ephemerides* of the *Curiosa Naturæ*, and we owe to M. J. Cloquet the history of a man, who had the eye and the orbit deeply excavated by a species of worm known under the name of *asticot*. I have also met with a patient, who being habitually uncleanly, and for a long time tormented by a ciliary blepharitis, had six enormous asticots at the great angle of the eye, between the inner extremity of the upper eyelid and the caruncula lachrymalis. The mode of destroying them, moreover, is the same as for the pediculus pubis, and other insects. It is also probable that camphor, so much praised by M. Raspail, (*Gaz. des Hôpits*, Novembre et Decembre, 1838,) if it were associated with mercurial topics, would give them still greater efficacy.

B. Foreign bodies of a certain size may also sometimes remain implanted for a considerable length of time in the eyelids or front part of the eye without being perceived there. A young man entered the hospital of La Charité, in 1837, with a sub-acute ophthalmia. The cornea preserved its transparency; a grayish colored chemosis with an erysipelatous tumefaction of the upper eyelid, which phenomenon was more marked in the direction of the temple than towards the nose, immediately struck my attention. The young man, who suffered but little, did not know to what to attribute his malady, which had existed for the space of fifteen days. By dint of researches, I finally discovered in the superior oculo-palpebral groove, the yellow extremity of a body which I immediately seized with a forceps, and which was nearly an inch in length and a line and

a half in diameter. It was a piece of hay-stalk, which had penetrated into the orbit while the patient was asleep upon a cart loaded with hay. Borichius (*Collect. Acad.*, partie étrangère, t. VII., p. 321) speaks of a thorn which in this manner remained for a period of thirty years in the inner angle of the eye before it occasioned any pain, and which ultimately produced a violent inflammation. A stem which was more than an inch long, and which entered the orbit through the eyelid, remained there also, says Willius, (*Collect. Acad.*, t. VI., p. 248,) a very long time without being recognized, though it produced very serious accidents, with delirium and convulsions.

C. *Fragments of whalebone* of a line or two in length have, in the same manner, become lost under the conjunctiva in a patient mentioned by St. Yves, (*Mal. des Yeux*, p. 210, art. 12.) Bidloo, Scharschmidt and Percy (*Chirurg. d'Armée*, p. 112, 113,) give similar instances of pieces of wood, glass and pipe-stem. M. Maunoir (*Corps étrang.*, 1812, p. 212) speaks even of chesnut shells which have thus become fixed on the front part of the globe of the eye; and M. Champion has noticed the same thing. There have also been seen hairs that had grown from the caruncula lachrymalis, as in the case cited by Albinus, and become incurvated outwardly so as to give momentary irritation to the eye. Demours (Séance de l'Académie de Méd., 22d May, 1828) speaks of a barb of a barley ear which had introduced itself into the lachrymal punctum in such manner as to project outside, but to a very small extent. A case also has been mentioned which was noticed by Dupuytren (*Archiv. Gén. de Méd.*, t. XVII., p. 126), and in which an eyelash had, by curving backwards, become entangled in one of the lachrymal puncta. I will add that a woman who thought she had a small tumor on the sclerótica, at the outer angle of the eye, and who had carried this pretended tumor for the space of nineteen months, had there nothing more than a particle of millet seed, which had come out of a bird-cage, and which appeared to have been kept in its place merely by atmospheric pressure. I have seen the same thing on various other points of the globe of the eye, and even on the cornea. In all cases, the little cup reposed by its concavity on the eye, and seemed to have embedded itself into the conjunctiva. I have also found on the cornea small scales, either of cinder or copper or iron, which had retained their position in the same manner for the space of several weeks without occasioning serious accidents. A patient whom I exhibited at the clinique of La Charité, in 1837, had one of these scales in the front part of the cornea for the space of fifteen months, and had paid so little attention to it that it was for another disease that he was induced to come to the hospital.

D. A gold or silver ring, the head of a long pin, a small roll of paper, an earpicker, or any other smooth and round substance, will answer for removing the different solid foreign bodies which continue movable between the eyelids; but it is not always the same with particles of metal, stone, wood, &c., which having been projected upon the organ of vision, become fixed and retained there. In such cases, when we are not afraid of breaking them, the point of a pen, cut in the manner of a toothpick, or any other similar instrument glided upon the front part of the cornea often succeeds in detaching



them. At other times we cannot do this except with the point of a lancet, and in some cases even only by making use of a small pair of forceps skillfully managed. It is only under very rare circumstances, and when the ferruginous corpuscle is scarcely adherent, that the load-stone, as recommended by F. de Hilden, (Bonet, *Corps de Méd.*, p. 393,) (who boasts much of the successes thus obtained by his wife,) could be usefully employed. The same remark would apply to the roll of Spanish wax employed by Deshayes Gendron, or to a piece of amber to attract to the outside particles of straw. When we decide upon the operation an assistant is charged with holding the eyelids apart. The operator directs the point of a lancet or of a very sharp-pointed bistoury to the circumference of the foreign body, which he isolates down to a certain depth in the substance of the cornea, then seizes hold of it with a very fine and well adjusted forceps, draws it while moving it gently for fear of breaking it, and afterwards pursues the same treatment as in a patient having an ordinary ulceration or simple ophthalmia. This operation moreover does not in itself present any difficulty; it merely exacts address and great precision in the movements. Moreovér, when the body to be extracted projects beyond the level of the eye, if it is solid and does not penetrate into the chambers, we almost always succeed in detaching it by scraping it with the border or the side of the point of a lancet or cataract needle.

E. If, as I have seen in different patients, grains of powder, or lead, or fragments of percussion-caps, glass, metal, or of a watch-spring for example, should happen to penetrate into the eye, we should, supposing that they could be perceived, not hesitate to cut into either the cornea or sclerotica in order to search for and extract them with an ocular forceps, or cause their expulsion in any manner whatever.

## § II.—*Various kinds of Vegetations.*

A. *Pterygion*.—When, by means of resolvents judiciously employed, we have not been able to disperse the pterygion, and that it advances upon the cornea to such extent as to make us apprehend the loss of the sight, it must be removed by means of the bistoury or the scissors. The section of the vessels which go to it, and which Beer still recommends, its strangulation by means of a thread passed between the conjunctiva and sclerotica, as preferred by La Vauguyon, and also cauterization, have succeeded in more than one instance; but as all these means are uncertain and more difficult of execution than excision, they have generally been abandoned. In order to remove the pterygion we seize hold of it with a good pair of forceps in one hand, at one or two lines from its point; we draw upon it a little towards ourselves as if to detach it; and soon perceive a slight crackling sound similar to that of unrolling parchment. Then it becomes easy to isolate it either from its apex to its base, or vice versa, as M. Flarer recommends, (*Thèse de Lefebvre*, Paris, 1829,) by means of the bistoury or a good pair of scissors. As the cornea rarely resumes its primitive transparency opposite the wound, Boyer recommends with reason, as I think, when the point of the pterygion has approximated very near the pupil, not to prolong the dissection as far as that, but to excise only the posterior four-fifths

of it. Emollient lotions during some days, and afterwards resolvent applications, as in all chronic phlegmasias of the conjunctiva, constitute its consecutive treatment. I have operated for pterygion by this process, in patients who had two, three, four, and even five of them on the same eye; I have never found any serious difficulty in it, and I cannot comprehend either the dangers which M. F. Cunier (*Bulletin Méd. Belge*, t. I., p. 296) charges it with, or the importance of the methods which have been proposed to be substituted for it. When the pterygion is not very thick, Scarpa is of opinion that in the greater number of cases it is sufficient to excise a semilunar flap from it opposite the point of union of the sclerotica with the cornea, and that in other cases we may destroy it entirely; that in order to prevent a cicatrix raised up in the form of a border, we should first detach the apex, then the base, and finally terminate with its middle portion. I do not, however, conceive that this last precaution can be of any great moment, and partial excision, which I have tried in three instances, has not succeeded with me. In all cases it is prudent to follow the advice of Boyer, and to apprise the patient that, notwithstanding the operation, he may not be perfectly cured, because of the species of spot which is too frequently the result of it.

B. *Pannus*.—The periphery of the cornea is sometimes covered by a grey or reddish flattened vegetation, granulated like the back of the tongue, indolent, from a quarter to a half a line in thickness, and advancing more or less, in the manner of a ring, on the transparent portion of the eye. In certain cases, however, this variety of pannus forms only the segment of a circle, while in others there appear to be detached from it semilunar or triangular plates, which prolong themselves a little farther than the rest upon the cornea. M. Graefe (*Revue Méd.*, Mars, 1818, p. 464) gives an instance of one which entirely covered both eyes. Nothing but complete excision or cauterization can remove this disease. If the pannus has but little thickness and is entirely circular, the nitrate of silver answers, and should have the preference. When it is more solid and forms somewhat large plates, excision by means of a lancet or cataract needle held flatwise, (*portée en dédolant*.) followed immediately after by cauterization, is more appropriate. A vegetation of the same kind may be developed upon the cornea and remain completely independent of the conjunctiva. I saw a remarkable example of this kind in a forgerman, forty-five years of age. The plate, which was half a line thick, more than three lines long, and a line and a half in breadth, placed transversely and slightly concave above, was situated below the pupil, and left a very perceptible and perfectly sound strip of cornea between its lower border and the sclerotica. I destroyed it three times with the nitrate of silver, and three times the patient, who was very anxious to resume his occupations, left the hospital before being absolutely cured, and at the moment when there was the best reason to hope for a perfect cure.

C. *Horny Plates*.—M. Mirault speaks of a production which is much more singular still. The cornea of a man affected with trichiasis from his infancy, was covered with a kind of dirty white dry, and as it were, scaly skin. It was probably a xerophthalmia. Similar productions, or such as

were *horny*, have also been encountered on the front part of the eye in certain individuals affected with ichthyosis.

D. The cornea is also liable to other excrescences. Guerin makes mention of a young person of Macon, who had a *fleshy tubercle* as large as a pea on the front part of the pupil, and which he cured by one cut of the scissors. Some of them may be compared to *nævus*. M. Wardrop gives examples of them. In one case, the tumor was granulated, of a brownish color, and but little vascular. It was softer, of a reddish color, and placed half on the cornea and half on the sclerotica, in another patient. In a third case, three *long hairs* proceeded from it, and protruded like a pencil from between the eyelids. The same author quotes a case similar to this last, in the Baron of Gloucester, and remarks that Gazelli had also seen hairs growing from the cornea.

E. Among these tumors, there are some of them that are analogous to vegetations from the mucous membranes. These are a sort of fungus. M. Wardrop has seen two examples; one irregular, granulated, and partially on the sclerotica; the other darker and more solid. In a case cited by Voigtel, a cartilaginous point was found in the centre. Sometimes also the tumor derives its origin from an ancient ulcer. Maitrejan gives an example of this; but it appears that in his patient, the fungus came rather from the interior of the eye, than from the cornea properly so called. These different projections can only be cured by excising them completely; also, we must take care to cauterize the bottom of the wound immediately, if we expect to prevent all return; it is in this manner that Pellier succeeded in a patient who had a tumor of this kind caused by a burn from gunpowder.

### § III.—*Cataract.*

Although Galen and the Arabs had already pointed out the nature of cataract, centuries passed away before it was generally understood. The pellicle which constitutes the disease is situated, according to Culsus, between the uvea and the crystalline; on the contrary, according to Guy de Chauliac and G. de Salicet, between the iris and the transparent cornea. What contributed most to give prevalence to such errors, was the idea that the crystalline was the seat of vision. Therefore, as soon as Kepler had demonstrated in 1604, that the lens of the eye was no other than a refracting body, an actual surgical revolution was promptly brought about on this subject. Gas-sendi, who wrote in 1660, as well as Palfin and Marriotte, attribute to R. Lasnier or F. Quaré, the honor of having first sustained the idea that cataract does not depend upon an accidental pellicle, but on an opacity of the crystalline. Schelhamer, who imparted it to Rolfink, had taken the idea from a surgeon of the Hotel Dieu. Brisseau, Méry, P. du Petit, Borel, Tozzi, Geoffroy, Albinus, Bonnet, and Freytag, had also without doubt derived it from the same source. But it is to Maitrejan to whom we are indebted for having placed the fact beyond all dispute. In going from one error they were upon the point of falling into another; in place of never seeing cataract in the crystalline, it was now maintained that it was always there.



Ph. de la Hire, Freytag, and Morgagni, did not succeed without difficulty in establishing the fact, that this malady may also be produced by the opacity of the capsular membrane. It was S. Muralt, Didier, Heister, and Chapuzeau, for whom it was reserved to demonstrate, without rejoinder, that cataract is produced by opacity of the crystalline, that of its capsule, or of the matter in which it floats, and not always that of one part only.

A. *Cure without an operation.*—Though since the time of Celsus, who was the first that has spoken lucidly on this subject, it has been acknowledged that confirmed cataract is rarely cured except by the operation, properly so called, we should nevertheless be wrong in denying absolutely, the efficacy of any other treatment.

The cataract which is seen in scrofulous, scorbutic and syphilitic subjects, or in consequence of an inflammation or any other disease in the neighborhood of the eye, has disappeared in more than one instance, either spontaneously with the constitutional disease, or under the influence of general or local treatment judiciously directed. Maitrejan, Callisen, Alberti, Gendron, Murray, Richter, Ware, and many others, have given examples of this kind. Hyoscyamus applied to the eye according to M. Nostier, or a simple seton to the nape in the opinion of M. Champesme, (*Arch. Gén. de Méd.*, t. I., p. 290,) have succeeded in curing cataracts of very long standing. M. Diétrich recommends that we should arrest its development by repeated punctures to the eye, and M. Schwartz (*Revue Méd.*, 1828, t. III., p. 126) has cured three cases by means of revulsives, &c. With MM. Rennes, (*Archiv. Gén. de Méd.*, t. XXII., p. 206), P. Delmas and Manoury (*Biblioth. Méd.*, 1827, t. IV., p. 185), I have seen it disappear spontaneously. M. Janson (*Hôtel Dieu de Lyons, Compte Rendu*, 1824, p. 83) also gives two examples of this kind. MM. Larrey and Gondret affirm, moreover, that they have obtained similar results by means of moxas, the actual cautery, or the ammoniacal pomade applied upon different points of the head, especially to the siniput. Without admitting as certain with M. de Blainville (*Nouv. Bull. de Sc. Méd.*, Février, 1835, p. 31,) that the crystalline may be formed by its capsule; without conceding also with M. Campaignac, that cataract is only a symptom of disease of the envelope of the crystalline, it must at least be admitted that the cataract which results quite frequently from wounds of the eye, is to be ascribed as M. Watson (*Arch. Gén. de Méd.*, t. XII., p. 610) asserts to inflammation of the neighboring lamellæ. The repeated experiments of M. Neuner (*Journ. de Prog.*, t. VIII., p. 117; *Bull. de Férussac*, t. XIV., p. 194) have since shown with what facility opacity of the crystalline may be produced, by means of certain liquids introduced into the eye. The experiments and observations still more varied of M. Dietrich, (*Bull. de Fér.*, t. VI., p. 84; *Arch. Gén. de Méd.*, t. XII., p. 295,) Tartra, Beer, and Szen, though contradicted by those of M. Watson, exhibit the decided influence of wounds and certain acids in the formation of some cataracts. A cataract from infancy was cured by the evacuation of a brown matter, by means of a small puncture into the capsule. The crystalline, which was sound, remained, it is said, (*Gaz. Salut.*, No. 5, 1783, p. IV) in its place in both eyes, and the sight was reëstablished!! From hence, without

doubt, came the new method of M. Jungken, (*Arch. Gén. de Méd.* 2e série, t. X., p. 93.) It is doubtless difficult to believe that the crystalline, which is an inert body and the actual product of an exudation, and which receives neither vessels nor nerves, can recover its transparency after having actually lost it; but pus and other products which may be deposited in front of it, as in the three examples related by M. Boudant, (*Arch. Gén. de Méd.*, t. XXIII., p. 429,) being in more direct relation with the iris or ciliary circle, would be more or less influenced by the particular state of the eye and the general constitution of the individual. It is also well established at the present time, that traumatic cataract very frequently gets well without an operation. The case of cataract caused by a blow on the eye from the branch of a tree, as mentioned by M. Mondière, (*Arch. Gén.*, third series, t. II., p. 352,) ultimately disappeared spontaneously. I saw a similar case at the Hospital of La Charité in 1836.

A young peasant, of fifteen years of age, was struck upon the eye by the free extremity of a small green twig of a tree. A cataract was thereby immediately produced, which was perfect when first brought under my notice, at the expiration of fifteen days. In order to reduce the inflammation which existed in the eye, and also to facilitate the cure of the cataract, I had recourse to bleeding at the arm, a few leeches to the temple, frictions around the orbit with the mercurial pomade combined with belladonna, and afterwards to a large temporary blister over the cutaneous surface of the eyelids. After having become broken up into many fragments, which successively passed into the anterior chamber, the crystalline ultimately became completely dissolved, so much so, that the boy, after having been in the hospital two months, left there almost perfectly cured, and with a pupil which presented only one single small opaque point. I saw a similar result in 1837, in a young lady who wounded her eye with a pair of scissors. Another example occurred at La Charité in 1838. Some of the observations also related by M. Convers, (*Gaz. Méd.*, 1838, p. 513,) fully corroborate this fact. In a child of five years of age, mentioned by M. Gerson, (*Arch. Gén. de Méd.*, 2d series, t. VIII., p. 224,) the cornea having been wounded by the point of a knife, a cataract was thereby produced, which got well spontaneously. Nevertheless, if on changing its color, the crystalline evidently undergoes a molecular action subject to the laws of chemistry, and if spontaneous cataract is not the product of either an electric action, or of that species of oxydation suggested by MM. Richerand and Leroy, it would be still more difficult to refer it constantly, with M. Campaignac, to alterations in the secretion of its capsule. Such being supposed to be the case, we cannot see why, by a contrary combination, it might not sometimes be possible for it to return to its primitive condition. M. Luzzato (*Encyclogr. des Sc. Méd.*, 1836, p. 405,) speaks of a patient who, after having been a long time afflicted with cataract, was cured of it by a violent ophthalmia. On the other hand, the crystalline capsule may be torn and place the lens which it contains in contact with the humors of the eye, which in their turn effect its solution or favor its absorption, facts of which description we have on record. The crystalline having passed into the anterior chamber, in a patient of Ansiaux, (*Clin. Chir.*, 2d edit., p. 161,) ultimately

became dissolved there. This body disappeared in the same manner in the case cited by M. Bobillier, (*Rec. de Mem. de Méd. Chir. et Pharm. Milit.*, t. XVI., p. 240, 1825,) and I have seen the same thing occur in three instances.

*B. Surgical Treatment.*—Surgeons, moreover, have attempted, from the remotest antiquity, to destroy cataract by means of particular instruments. Celsus in fact leaves it to be inferred, that among the physicians of Alexandria there were many, especially a certain Phyloxenes, who had acquired in this respect a very great degree of skill.

*Conditions.*—I. If the *cataract* be *simple*, if it has its seat in the crystalline or has not contracted any unnatural adhesion with the surrounding parts, if the iris retains its power of contracting and dilating alternately, if the patient still distinguishes light from darkness; if no inflammation exists either in the eye or in the periphery of the orbit; if there be present neither cephalalgia, nor a catarrhal affection, nor any general disturbance; if the eyes are neither too projecting or too much sunken in their socket; if the patient is not too much advanced in age, and if he is sufficiently tractable to submit to all the necessary treatment, the chances of success are as numerous as could be desired. When, on the contrary, the patient is enfeebled by age, that spots exist upon the cornea, that the pupil remains immovable, that a greenish tint is observed at the bottom of the eye, that deep-seated pains are felt or continue to exist in the orbit, that a chronic ophthalmia or any other malady tedious and difficult to cure, and more or less serious in its character, exists in the neighborhood of the eye, we cannot count on success. In other words, so often as the crystalline and its capsule alone are diseased, that apart from the cataract the organ is in a natural state, and that there is nothing in the orbit that prevents the reëstablishment of vision, then, whether the cataract be true or false, formed by plastic exudation, (Simmeon, *Bull. de Fér.*, t. X.) or by a return of the crystalline to its embryo condition, (Grandclaudé, *Journ. Comp. des Sc. Méd.*, t. XXXI.) whether the cataract be lenticular, capsular, or capsulo-lenticular, anterior membranous or posterior membranous, hard or soft, milky or gypseous, barred, oscillating, stellated, pearly, with three branches or central, purulent, putrid, spotted or trellis-like, marbled, dry or husky, sanguineous, dendritical, yellow, grey or black, the operation should be recommended. In other cases, and especially if it is complicated with infiltration of pus (Dujardin, *Thèse, Paris*, 1830) or blood into the little receptacles of the vitreous humor, it should not be undertaken but as a dernier resource, when every thing had failed, and not until after having forewarned the patient of the slight chances that exist of a cure. Nevertheless we must not allow ourselves to be deterred by appearances.

The *immobility of the pupil* is not a certain sign of amaurosis. Wenzel, Richter, MM. Larrey, Watson, S. Cooper, &c., have shown, as I have often myself seen, that adhesions of the iris or contractions of its opening after an iritis may also produce it, and also that it will dilate and contract itself though the retina be paralyzed. I have many times seen dilatation with immobility of the pupil, in patients affected with cataract without complication of amaurosis.



Others have remained with a movable, narrow and very regularly formed pupil, without recovering their vision. Some patients who could not in any manner distinguish day from night have, after having been operated on, been more fortunate.

II. *Black cataract*, (cataracte noire,) which had already been noticed by Guy de Chauliac, Morgagni, Rolfinck and Freytag, and of which Maitrejan, Janin, Pellier, Arrachard, Wenzel, A. Petit, Edwards, Coze, (Dujardin, *Thèse, Paris*, 1830,) and MM. J. Cloquet, Riobé, Luzardi and Sanson, (*Journ. Univ. des Sciences Méd.*, Juillet, 1819,) have related examples, is too rare to arrest the attention of an intelligent operator, even in supposing, which is not demonstrated, that it may exist without changing of the color of the pupil. A young girl twenty-six years of age, blind in the usual way that patients affected with cataracts are, had nevertheless the pupils *almost* perfect. The crystalline was first extracted from one of the eyes and then from the other, and the operation, which was performed by M. Roux, (*Dict. de Méd. et de Chir. Prat.*, t. II., p. 108,) was perfectly successful. M. Carron du Villards, (Pasquet, *Lancette Franc.*, t. XII., p. 524,) and M. Robert (Carron du Villards, t. II., p. 271,) have observed similar examples: I also have noticed two cases. Moreover, when no organic lesion nor any serious symptoms render the operation formidable, I do not see why, when the patient is completely blind, we should refuse to undertake it. In such cases the patient can lose nothing, while on the other hand, should there be only one chance in a thousand, it would be uncharitable not to let him have the benefit of it. We must nevertheless absolutely desist from it as soon as there is a certainty of a deep-seated alteration in the eye.

III. *Tremulus Iridis*.—Should the crystalline or the humors be movable, or offer the slightest appearance of tremulous iridis, we should at least be careful not to operate by extraction. The case of a crystalline thickened, and spontaneously depressed, as mentioned by Turquet de Mayerne, was it not in fact complicated with tremulous iridis? (*Prat. de Méd.*, p. 90.) In a man who was in this condition, and to whose solicitation I finally yielded, the crystalline gently issued out of itself enveloped with its capsule a few moments after opening into the cornea, and the vitreous humor was in so limpid a condition that it would have escaped like water, if I had not immediately made pressure on the fore part of the eyes by means of lint. Cerebral accidents supervened and were sufficiently serious during some days, to give me the greatest degree of uneasiness. The left eye suppurated, and the right, although perfectly clear, remained altogether insensible to light. This is a state of things which I have often since met with, and which is imputable to a liquefaction of the vitreous humor. Depression alone may be attempted in such cases, if it is thought prudent to attack the cataract; the operation then produces scarcely any reaction in the eye. It has at least the advantage of causing the disappearance of a deformity by again giving to the pupil all its regularity, and this result is not to be disdained when there is only one of the eyes in a state of cataract. The mobility of the crystalline is sometimes hereditary. Portal (*Malad. Heredit.*, p. 87, 3rd edit.) gives an instance of two brothers who were thus affected, and whose father had the same peculiarity.

The crystalline rested in part in the anterior chamber, as in the two patients noted by me.

IV. *Anomaliés.*—*False cataracts*, which are almost always complicated with affections of the iris, or some other membrane of the eye, are not generally so easy to destroy as the true cataracts. All other things being equal, the crystalline cataract is of a less serious character than the capsular, or that of the humor of Morgagni. I have seen patients *completely blind*, though their *crystalline* was only *slightly opaque*. In others, the *cataract* appeared so *advanced* that nothing more was required for its maturity, and nevertheless *they could still see* very well. A dealer in grain in the environs of Paris furnished me a very fine example of this species in 1838, at La Charité. Arrived at the Hospital from his own residence without a guide, he could count his fingers and distinguish faces, though to appearance his two cataracts were as complete as possible. I have had occasion to remark, that persons who could see in spite of their cataract, had an opacity of the crystalline only, or of the posterior capsule, and that in them there existed a certain free space between the iris and the lenticular apparatus.

V. A *light* which is made to pass in front of the eye of a patient who does not see, will, provided there be no opacity in front of the vitreous humor, produce *three images*, one anterior, regular, (*nette*,) and straight, one deep-seated, large, diffused, and also straight, and a third in the middle small, pale, and reversed. The anterior image alone will remain in the case of complete cataract. But it is the deep-seated image only which is effaced when the opacity is concentrated upon the posterior layers of the crystalline or its membrane. This method, which I have often tried, and the use of which has been sanctioned by M. Janson, (*Pasquet, Thèse, Paris, 1837*,) has however appeared to me to afford very little reliance. It is useless in ordinary cases, and I do not think it would be sufficient in doubtful cases.

VI. *Ages.*—In children, the operation, though difficult to be performed, succeeds better than in adult age, and so much the better after that, as the patient approaches nearer to the middle period of life. The table arranged by M. Drache (*Thèse, No. 180, Paris, 1837*,) shows what are the influences of age and other personal conditions on the formation of cataract. Almost all authors agree with Sabatier, that we ought not to recur to the operation except in persons who are old enough to know the benefit of it; that it ought not for example to be employed before the tenth or fifteenth year.

a. The intractability of *children*, the little anxiety they have about obtaining their sight, and the dangers we should have to incur in endeavoring to operate upon them in spite of their wishes, and the difficulty of subjecting them to the necessary precautions, are the principal motives upon which this precept is established. But if in the tender age the operation is more delicate and more hazardous, and the membranes of the eye from being more tender, thinner, and less dense, are more easily penetrated; the eye is less movable, the pupil more large, and such patients, dreading only the pain, are in nowise concerned about the consequences of the operation. As this operation is rarely accompanied with severe pain, I cannot see how in such

cases it can have any thing in it of a very formidable character. It is, moreover, always practicable to confine even the youngest subjects, and to keep their eyelids separated apart. The eye is an organ essential to the development of intelligence, and the source of the greatest number of our ideas. If its functions should be found abolished at birth, its development ordinarily remains incomplete; it acquires gradually an excessive degree of mobility, which renders the operation much more delicate, and diminishes the chances of success.

In conclusion, when we reflect upon the importance of the education of children, it would be really difficult not to admit with Ware, Lucas, Saunders, Travers, Beer, &c., the advantage of relieving them as speedily as possible of cataract. Nevertheless, I am not of opinion that we ought, in such cases, to select the age of two years, as Farre recommends, or the period of six weeks, with M. Lawrence, rather than the the first or third year.

b. In *old men*, the disease being almost a natural consequence of old age, the operation is inadmissible, except they earnestly desire it, and are moreover found in the best conditions possible. I have performed it, however, in a man of eighty years of age, and in a woman of eighty-five, with a successful result, which is far from being always obtained in young subjects.

VII. The five hundred cases of cataract which I have noted up to the present time have not enabled me to assert that males are more frequently affected with it than females. We see by the researches made by M. Maunoir, (*Thèse*, No. 345, Paris, 1833, p. 13,) that out of one hundred and twenty-one cases of cataract observed at La Charité there were sixty-one men and sixty women; while at the Hotel Dieu, out of two hundred and seven patients, there were only seventy-two women, while there were one hundred and thirty-five men. Before the age of thirty years, acquired as well as congenital cataract is almost always soft or capsular. After sixty, it is almost constantly solid and lenticular. The period from forty to sixty years is that which is most liable to it. Between fifteen and forty years, we must be on our guard, for it often indicates a more profound disease of the eye. Although out of seventy-two cataracts examined under this point of view by M. Maunoir, (*Lancette Franc.*, t. I., p. 392,) thirty-five only had commenced in the right eye; this eye, according to my observation, is more frequently affected the first than the left. I have met with five patients who, from different causes, had been suddenly seized with it, like the peasant mentioned by M. Wendelstrum, (*Thèse citée*, p. 29.) In twenty cases out of two hundred it has appeared to me to be hereditary. A man whose two elder brothers, a sister, his grandfather, and great grandfather had had the same misfortune, was seized with cataract at the age of forty-two years. M. Maunoir (*Thèse citée*, p. 21) states that out of thirty-nine cases of cataract he found ten that were hereditary. In the same family at Argentan, (Duval, *Thèse*, Paris, 1830,) four of the daughters and the father and mother were attacked with this disease. But all this should not prevent us from recurring to the operation.

VIII. *Single or double*.—When the cataract occupies one eye only, there are physicians who proscribe the operation. With one eye, say they, we can see sufficiently well to get along, distinguish objects,



read, and, in fine, fulfil all the duties required of us by our social wants. The operation may produce an acute inflammation, render the sound eye itself diseased, as M. J. Cloquet has seen, and produce a complete blindness. Even upon the supposition that it does succeed, the focus of luminous rays being no longer the same in both eyes, there necessarily results from it a discordance, followed with confusion of vision, &c. To this reasoning it may be objected that if the sound eye is sometimes destroyed after the operation, this accident rarely happens; that we see undisputably better with two eyes than with one only, and that the presence of one cataract appears to be good grounds for supposing that another may supervene upon the opposite side. As to the difference which it is supposed will take place in the field of vision after the displacement or extraction of the crystalline, experience has now demonstrated that it is not the fact. Maitrejan, St. Yves, Wenzel, &c., relate cases in which no mention is made of it, although the patients had been operated on in one eye only. I have published some facts of this kind, collected at the Hospital of Perfectionnement. M. Luzardi writes me that he possesses a great number of similar instances, and I could myself, at the present day, add near fifty cases to those which I announced in 1826. Nor, finally, has M. Roux, who has very often extracted the cataract, found, though it existed on one side only, that it was necessary for the patients afterwards to wear glasses of different forms for the two eyes. Therefore, if the patient is young and of good constitution, if he desires or earnestly requests to be cured, we ought to subject him to the operation, even though one of his eyes may be wholly sound.

IX. *Maturity of the Cataract.*—Formerly it was supposed that cataract passed through different degrees of consistence; that soft and diffuent in the beginning, it becomes gradually firm and solid; in a word, that it may be *ripe* or *not ripe*. At the present day science is under the empire of more correct opinions. It is now known that cataract may be very solid at the commencement, and become almost liquid after a long lapse of years. It is nevertheless true, that the contrary is very frequently observed, and that the idea of maturity and immaturity is not altogether destitute of foundation. Cataract being almost constantly the result of a morbid action from some internal cause, is not in reality perfected until at the moment when this cause ceases to act on the eye, and when the opaque body is no other than a *necrosed* portion of the organism, and an actual foreign body. It is not, therefore, because it is too soft or too hard, that we ought to wait for its complete development; but because its progress not being limited, there are then evidently less chances of success than at a more advanced epoch, and when its separation (coction) has been perfectly effected.

X. *The two Eyes.*—Scarpa, Dupuytren, and many other skillful surgeons have maintained that it is better when the cataract exists in both eyes, to perform the operation first on one side, and not to have recourse to the other until after the cure of the first. If it succeeds, the patient may rest satisfied with it, so long as the eye is not too much enfeebled. If it fails in its results, there still remains at least one more resource. The patient bears the second operation with more courage and less alarm than the first. When we operate on

both eyes at the same time, the inflammation may be communicated from one to the other, the reaction must be more acute and the danger of accidents supervening greater than when we operate on one eye only. Boyer and Dupuytren have remarked on this subject, that double ophthalmia when once developed, rarely fails of arresting itself definitively on one eye only, which takes upon itself, so to speak, the onus of the disease of both, and in most cases ultimately becomes destroyed. The whole of this is questionable; and as the simple operation, even in the most fortunate cases, only imperfectly reestablishes the sight; as patients much rather prefer to sustain the two operations consecutively, than after a certain interval of time; as the operation on one side sometimes causes inflammation of the sound as well as diseased eye; and as the double operation presents numerous favorable chances for one of the two eyes at least, if not for both, I conclude, with Wenzel, Demours, Forlenzi, Boyer, &c., that all other things besides being equal, it is better to adopt this last course.

XI. The *preparations* that the ancients caused their patients to submit to, are almost wholly laid aside by the moderns. At the present day, we limit ourselves to the employment of a regimen more or less rigid during the space of several days; bleeding, some laxatives or a gentle purgative; diluent drinks or antispasmodic and anodyne preparations, according as the patient exhibits certain indications of plethora, obstruction in the alimentary passages, or too great a degree of nervous irritability. As a preventive means of inflammation, there are some who apply a blister. Scarpa places it upon the nape fifteen days beforehand, and M. Roux only the evening before. Forlenzi prefers placing it upon the arm. I am not certain that this application is not more dangerous than useful. Many practitioners dispense with its use, and do not appear to have had cause to regret it. If adopted as a general precept, it must frequently do harm. During the first days, it sometimes produces a heat in the skin, and an irritation which may react in an unfavorable manner upon the eyes. If we confine ourselves to placing it upon the neck, it would then be better to follow the rule of Scarpa, or of Dupuytren, who, when he thought proper to make use of it, left it on fifteen days before proceeding to the operation. On the arm it is evident that the patients can receive no disadvantage from it; nor can we perceive that it can have the least degree of efficacy. For myself, I use it only after the operation, upon the supposition that special accidents require its employment, and I have not found that there were any objections to be made against this mode of proceeding.

XII. *Seasons*.—Spring and autumn, which are more favorable than winter or summer for the success of all operations, have been selected also for those of cataract. We cannot undoubtedly refuse to those two seasons some advantage to the patients, in consequence of the temperature, which is usually more mild and uniform than at other periods of the year; nevertheless, as these conditions may be obtained or found at any time, cataract may in fact be operated upon at any season. We ought not, however, to decide upon it without caution, if an epidemic of a somewhat grave character should be prevalent, especially those which more particularly affect the mucous membranes. When there are prevailing catarrhal affections, dothin-

enteric fevers, ophthalmias, measles, or even erysipelas, prudence requires that we should refrain from it.

*C. Operation for Cataract by Depression.*—In some cases we confine ourselves to displacing the crystalline, or placing it under such circumstances, that it may disappear under the influence of the action of the organism; in other cases, on the contrary, we expel the cataract from the eye, in endeavoring to remove the opaque body in its totality, which constitutes two general methods, that of depression and that of extraction. The first, still known under the title of the method by *depression*, comprises, moreover, the method by reclinacion (*réclinaison*), or *reversion*, or that by discision (*discision*), or breaking up (*broiement*), and is performed in different ways; it takes the name of *scléroticonyx* for example, when in order to reach the crystalline the needle is directed upon the sclerotica, between the uvea and the vitreous humor, or when we purposely penetrate through the hyaloid substance; and it is called *kératonyxis* when we reach the eye in its anterior chamber, through the transparent cornea.

*I. Preceding steps.*—The evening before the operation, the patient, who should have taken only light soups, ought to have administered to him an injection, if his bowels are not already free. An aqueous solution of the extract of *belladonna* applied between the eyelids an hour or two beforehand, forces the pupil to dilate itself largely, enables us to follow with the greatest degree of certainty all the movements of the needle, to avoid the iris with greater facility, and more readily to compel certain portions of the cataract to pass into the anterior chamber, should that be judged necessary. The irritation which such an application produces, is too trivial to be worthy of consideration. The momentary mydriasis which results from it soon disappears, and alters in no respect the functions of the organ. The advantages which it gives are in reality of the highest degree of importance, and should not be sacrificed to idle fears. In irritable and timid persons, in whom the eye is very movable, it is well in order to accustom this organ to the contact of foreign bodies, to touch it several times during the space of some days, with the blunt extremity of any instrument whatever, or even with the *finger*.

*a. The articles* comprise two needles at least, in order that if one should fail, we may continue the operation with the other; a cap or serre-tête, which should accurately embrace the cranium; a long compress to cover the sound eye while we are operating on the other; small oval pieces of fine linen, perforated with holes, and which are to be placed in front of the orbit after the operation, in order to prevent the lint from coming directly in contact with the lids; a bandage of linen folded double, sufficiently long to go round the head, four to five fingers' breadth in width, and presenting at its middle portion, near its free border, the division of a *J*, reversed, to lodge the nose; finally, a band of black taffeta designed for covering the preceding; lastly, a fine sponge, hot water and pins.

*b. Needles.*—As it is more especially for extraction that the *speculum*, elevators and *ophthalmostats* have been proposed, I shall say nothing of them in this place.

As to the needle, we have an infinite variety of them. The one



that Celsus recommends was spear-shaped, straight, and two inches long; at a subsequent period, it was found more convenient to make use of those that are round; since then the triangular needle has been revived. At the present time, every oculist, so to speak, has his own. That which Scarpa succeeded in rendering popular, slender, and only eighteen lines long, is terminated by a point slightly widened, curved into the shape of an arc, flat on its convexity, and cut into a ridge on its concavity, and like all the others, mounted upon a handle of flat sides and bearing a mark of a different color on its back. *Dupuytren* rejects the kind of crest which is found on the concave surface of the needle of Scarpa; his, on the contrary, is somewhat more flat on this side than on the back, in order more accurately to embrace the crystalline, and to expose it less to be divided when we endeavor to depress this into the bottom of the eye. He also recommends that it should have less breadth, and that its body, slightly conical, should completely fill up the track traced by the point, in order that the humors cannot in any degree flow out during the operation. The point of that which is adopted by *M. Bretonneau*, is shorter and also as broad as in the needle of Scarpa. Its body, which is of melted steel, finer and almost cylindrical, passes freely and without the least effort through the opening in the sclerotica. It is an advantage which the instrument of *Dupuytren* does not possess, but one which exposes the eye to be partially emptied of its aqueous humor. The needle of *Beer*, which many German oculists make use of, is straight and spear-shaped, and differs from that of *M. Bretonneau* only in having its body conical and thicker. *Hey* proposed one which has only ten to twelve lines in length, and which in its form approaches much nearer to a chisel than that of a needle; being a simple modification of that of *Hilmer*, which is conical, its free extremity, which is flattened and terminated in a half moon, is its only cutting portion; the edges, which are straight and rounded, and its want of a point, make it difficult to wound the iris when we are directing it towards the pupil, while its form of that of a small palette renders the depression of the crystalline less embarrassing. With an instrument of this kind, it would be almost impossible to destroy a membranous cataract, or even to open conveniently the anterior capsule in lenticular cataract, and inasmuch as the breaking up of the lens to which the author specially designed it, can be perfectly well accomplished with any other needle, there is no reason why it should have the preference. *MM. Graefe, Langenbeck, Himby, Schmidt, Spitzac*, (*Fascicul. d'Obs.*, &c., p. 22, Paris, 1829,) *Mid-dlemore*, &c., have also each in their particular way modified the cataract needle. But the difficulty does not lie here. In the hands of a skilful operator, all these instruments are good. In this respect those of Scarpa, Dupuytren, and *M. Bretonneau* are quite as good as any of the others. The needle designed by *Guerbois*, (*Journ. des Conn. Méd.*, t. I., p. 250,) with a double rest on its concavity, does not present sufficient advantages to be retained. *M. Bergeon* has proposed one which two lines in breadth, and hollowed out in the form of a small spoon, would in my opinion be of dangerous employment; although it renders the displacement of the crystalline sufficiently easy. If the needle which *M. Charrière* has shown me,

and which when once in the eye opens itself in the manner of a lithotome of F. Côme, did not expose us to the danger of wounding the iris, and of entangling itself in the neighboring tissues, it might possess some advantages. The one which I prefer is somewhat more incurvated and more flattened, without being less in length or much broader than that of Dupuytren.

II. *Scléroticonyxis*.—Up to the eighteenth century, they caused the patient to be seated astride a bench. Barth and Arnemann prefer that he should be standing. Poyet, A. Petit, and Dupuytren, advise that he should be operated on in bed. In France, the patient is generally placed upon a solid chair of moderate height. Beer recommends a stool, and Richter a chair with a perpendicular back, while in England they give the preference to a music stool. In this respect there can be nothing fixed. Though the seated position is evidently the best, the others may also be adopted without serious inconvenience.

a. *Ordinary process*.—The surgeon places himself in front, either on the same bench with the patient, whose knees he holds between his thighs, as in the time of Celsus, with a small cushion to support his elbow, as recommended by J. Fabricius; or he stands up, as Dupuytren and a great number of others advise; or he seats himself on a chair somewhat elevated, in such a manner as to be able to place his foot upon a stool, and to support his elbow upon a cushion on his knee, as directed by Scarpa. When seated, there is more fixity in his movements, since the elbow is supported; when standing up he is more free and more at his ease. Some surgeons separate the eyelids themselves, and dispense with assistants. Barth never operated otherwise. In this respect there has been much praise bestowed upon the skill of M. Alexandre, who again, it is said, is surpassed by Dr. Joeger in Germany. The thing doubtless is possible, but exhibitions of force cannot be taken as a rule, and there is no operation in surgery which more requires an intelligent assistant, than cataract. It is necessary that he should have a light hand, that he should perfectly comprehend every stage of the operation, and all the movements of the operator, and that he should be as practically conversant with it as possible. Being placed behind the patient, he embraces the head, and holds it against his chest with one hand, while with the other he elevates the upper eyelid. Should we desire to have recourse to any instrument to open the eye, the double erigne of Bérenger, or the blunt hook of some others, could evidently be replaced by Pellier's elevator of silver wire. In general the finger is preferable, whether with Scarpa, we make use of it to raise and to keep up the free border of the upper eyelid against the supra-orbital arch, without touching the eye; or whether after the manner of Boyer, we push it (l'enfoncé) against the posterior surface of the superciliary border, while incurvating its last phalanx in the manner of a hook. By this last mode, the eyelid is found to be more firmly fixed; but the angle formed by the phalangeal articulations, causes more inconvenience to the operator, and the eye runs more risk of being compressed. Forlenze was in the habit of causing the entire tegumentary covering of the eyelid to be drawn towards the eyebrow, as if for the purpose of folding it or forming a border with it

there. In this manner the ciliary border, or tarsal cartilage, is raised as high as possible, and the pulp of the finger leaves less facility for the skin to escape. The most certain means of preventing our loosing our hold before it is time, consists in placing a piece of dry linen between the finger and the integuments, in order to prevent them slipping over each other. If the patient is in bed, the surgeon places himself on the right for the left eye, and on the left for the right eye; adjusts the cap and fixes it with the bandage; covers one of the eyes, whether it is diseased or not, with a small piece of coarse lint, and a long compress passed obliquely round the head. The assistant, free or raised on a chair at the head of the bed, prepares for elevating the eyelid.

*First stage.*—With the forefinger corresponding to the diseased side, the operator depresses the lower lid and fixes the eye. With the other hand he seizes the needle in the manner of a writing-pen, directs its point perpendicularly upon the sclerotica, at one or two lines from the transparent cornea, a little below its transverse diameter; turns its concavity downwards, one of the cutting edges towards the cornea, and the other towards the orbit, in order that he may penetrate, rather by separating apart, than by dividing through, the fibres of the coats of the eye; first inclines the handle of the instrument with a considerable deal of force downwards, then raises it gradually in an opposite direction in proportion as he enters into the posterior chamber, and makes use of his two last fingers in order to procure a point d'appui, between the parotid and the cheek bone.

*Second stage.*—Before plunging it in farther, he turns the instrument upon its axis, in order that its concavity may face backwards, and that he may be enabled to pass without danger below, then in front of the crystalline, while penetrating from without inwards and slightly from behind forwards, without touching the iris or lenticular capsule, if he possibly can, as far as into the pupil and anterior chamber. He then passes its point circularly several times around the anterior circumference of the lenticular body, the envelope of which is in this manner lacerated as completely as possible.

*Third stage.*—This being accomplished, the surgeon applies the arc of the needle directly upon the front part of the cataract, which he then draws by an oscillating movement downwards, outwards, and backwards, into the bottom of the eye, below the pupil and the vitreous humor, where he holds it fixed for the space of a minute, in order that it may not become disengaged.

*Fourth stage.*—The instrument is then drawn back without shaking it, by small movements of rotation; it is brought back to the horizontal position; we again turn its convexity upwards, and remove it from the eye, by making it pass through the same track it had taken in entering.

*Remarks on the preceding different stages.*—Many points in this operation require particular attention.

1. To make use of the *right hand*, for the right as well as the left eye could be of use only to those surgeons who are not ambidexter, and it is not often that these latter venture to perform operations on the eyes.

2. If the *needle* were directed *above the transverse diameter* of the



sclerotica, as some practitioners, and among them M. Pilson, have recommended, it would become almost impossible to depress the crystalline completely, or to avoid leaving it more or less near the centre of the eye. In applying it exactly upon the external extremity of this diameter, we should be certain to wound the long ciliary artery, and to produce an internal hemorrhage. It is below it therefore that we must apply it. When its convexity is turned forward, as Scarpa recommends, the fibres of the sclerotica, as well as some of the ciliary nerves and vessels, are necessarily divided, whereas nothing like this takes place if we conform to the precept which I have laid down.

3. J. Fabricius laid it down as a rule that the *needle ought to be plunged in at the union of the sclerotica and cornea*. Others, with Purmann, say at half a line from this last; some at a line and a half; several at two lines, two lines and a half, and even three lines; there are those who say the breadth of the nail or of the stalk of a straw, the middle of the white of the eye, &c., and those who are in favor of going as distant as possible from it, are influenced by the fear of wounding the ciliary circle or processes. Among others, there are those who, like Platner, apprehend the lesion of the tendinous portion of the rectus externus muscle or the nerve of the sixth pair. Fabricius, in approximating the cornea, specially designed thereby to reach more directly in front of the cataract, while the majority look only to avoiding with greater certainty the retina. As to the fact itself, two things appear to me indisputable: it is that the puncture of the fibrous expansion of the rectus muscle involves not the slightest inconvenience, and that that of the retina is unavoidable when we penetrate through the sclerotica, at whatever distance it may be from the cornea; from whence it follows, as a general rule, that there is no danger in receding from, while there would be in approximating too near to the ciliary body.

4. In turning *the back of the needle forward*, when we wish to pass it below and then in front of the cataract, and to conduct it in this manner in the anterior chamber through the pupil, our object is to protect, with as much certainty as possible, the retina and the iris from the action of its point or cutting edges. If we work with it in the anterior chamber, it is in order to be more certain that it may not work between the lens and its envelope. The laceration of this last is a more delicate and important operation than is generally supposed; it is upon its circumference that we must commence. If we pierced it first at the centre, it would be very difficult afterwards to detach the flaps from it, and to prevent the formation of a secondary cataract. The best mode undoubtedly would be to depress at once both the crystalline and its capsule, without breaking them, as some authors have recommended; but by what mode could we force a membrane so delicate to the bottom of the eye without dividing it, provided that its adhesions have retained some degree of firmness?

5. It is not sufficient, in order to depress the opaque body, to seize it with the point of the needle. The *concavity of the instrument* ought moreover to embrace exactly and flatwise its anterior surface at its middle portion, from the inner side of the pupil as far as to its outer portion; otherwise it would be reversed upon the slightest de-

gree of pressure, either from above downwards or from below upwards. The depression having once commenced, the needle represents a lever of the first kind, which finds its point d'appui in the opening of the sclerotica, and which, in order to make resistance outwards, backwards and downwards, should have the concavity of its point slightly inclined upwards, while we give to it the oscillatory movement mentioned.

6. *When the cataract is depressed*, it is recommended to the patient to look upwards and inwards without moving the head, supposing by that, but erroneously, that the crystalline would be made to descend lower down. In not withdrawing the needle until at the end of some seconds, time is given to the depressed cells of the vitreous humor to resume their natural position, and to imprison, so to speak, the cataract, which would almost mount upwards if we left it immediately. The small movements of rotation which the instrument is made to perform before disengaging it from the eye, have evidently for their object to disturb the crystalline as little as possible, and to be more certain of leaving it in its new locality.

7. If, notwithstanding all these precautions, the cataract mounts upwards again as soon as we cease to keep it depressed, we must seize it a second time and depress it farther down, and continue in this manner until it rises up no longer.

8. *When it is soft* the instrument ruptures it, and we rarely succeed in entirely depressing it below the pupil; in such cases, if it is not practicable to displace its fragments backwards, we endeavor to break it down into small particles, which are to be pushed forward into the anterior chamber, in order that their solution by the aqueous humor may prepare them for absorption. It is also to this place that we must direct every opaque particle which may be found to remain in the centre of the eye after the displacement of the crystalline. The foreign corpuscles are in this manner easily pushed forward in front of the pupil, provided they are completely liberated. Unfortunately the case is not the same, when our design is to place there the flaps from the crystalline envelope. In this case we must have skill and address to transfix, so to speak, each flap in succession, from before backwards or behind forwards, with the point of the needle near the centre of their base, and to detach them while rolling them up upon themselves, or by drawing them on the side near their apex. If the capsule adheres to the uvea we ought, before all other things, to effect its separation, and in doing this avoid the iris as much as possible. Upon the supposition that some circumstance may occur to prevent this disunion, we should necessarily be obliged to displace the crystalline at first, and act afterwards upon the anterior layer of the capsule, as has been described above.

9. *Crystalline in the Anterior Chamber*.—The cataract, at the moment of the operation, may, in consequence of some sudden movement of the patient or the operator, escape through the pupil and fall into the anterior chamber. This may also happen spontaneously from various causes, as blows, falls, sudden strokes, and anything which may concuss the head of the individual, or in any manner bring about the rupture of the lenticular cyst. This circumstance does not necessarily oblige us, as has been supposed, to resort

to the extraction of the displaced disc. Inasmuch as it has gone through the pupil, in order to place itself in front, it could traverse it again to get behind, and it will always be found more agreeable, both for the patient and the surgeon, to terminate the operation while the needle is in the eye, than to withdraw it again in order to incise the cornea. In the cases even where nothing yet has been attempted, it is no obstacle to depression, provided the pupil remains dilatable and that there is but very little degree of inflammation. Dupuytren and M. Luzardi, who, under such circumstances, have made use of the ordinary needle, have plunged it through the sclerotica and pupil into the anterior chamber, in such manner as to seize hold of the lens, whether opaque or not, and which they have afterwards succeeded in conducting into the bottom of the posterior chamber. I have frequently noticed this accident, but it never has appeared to me of serious character at the moment of the operation. There are, moreover, some singular facts in relation to this subject. In a patient of M. Monod the crystalline remained in the anterior chamber. This woman, having left the Hospital of Cochin, came to the clinique two months afterwards. I then noticed that the crystalline occupied its usual place in the posterior chamber.

Having left my service at the expiration of six weeks, the patient came back again three months subsequently, when the crystalline was again found in the anterior chamber, having vessels which appeared to have penetrated into it, and where, being now reduced to a third of its volume, it appears to constitute a part of the cornea! In another case the crystalline having passed into the anterior chamber several months after depression, repassed into the posterior chamber while Pellier (*Gaz. Salut.*, No. 50, p. 4, col. 2, 1760,) was dividing the cornea in order to extract it.

10. In *milky cataract*, if as almost always happens, the capsule itself is affected, it is almost indispensable to carry the instrument as far as to the centre of the pupil without dividing anything, otherwise the opaque liquid diffuses itself into the eye, renders the humors turbid, and prevents us from any longer seeing what we are doing. Nevertheless should this accident happen, and whether the needle was or was not in the anterior chamber, we ought before withdrawing it, to simulate as accurately and with as much caution as possible, the manipulations necessary to break down whatever it might be necessary to destroy.

11. *Purulent cataract*, of which I have seen two very marked examples, would require no additional attentions, as its absorption is also speedily accomplished.

12. If, as I have often seen, the *cataract* should, on the contrary, be very *hard*, stony, cretaceous, or like *tupha*, (tophacée,) which is recognized by its unequal, ridgy, and white or yellow calcareous color, we should treat it in the same manner precisely as an ordinary crystalline, except that its capsule being folded and retracted, and, as it were, parched up, cannot be isolated from the rest, and must be depressed with the same stroke. Should the cornea, (Darcet, *Thèse citée*.) the crystalline, (Kulm, *Chir. des Hopit.*, t. III., p. 397.) or vitreous humor (Middlemore, *Revue Méd.*, 1838, t. III., p. 269.) be ossified, any operation doubtless would be useless.



*b. Other Processes.*—1. *Process of Petit.*—At the commencement of the last century, some authors sustained, contrary to Hecquet, de la Hire, &c., that the seat of the cataract was always in the crystalline. Petit, adopting this hypothesis, proposed to accomplish the depression of the opaque body without touching the anterior layer of the capsule. After having plunged the needle into the posterior chamber, he inclines one of its cutting edges outwards and backwards; opens into the vitreous humor in this direction; brings the needle back to the outer, lower, and posterior part of the capsule, which he ruptures, secures the crystalline by hooking into it, and passes it into the substance itself of the hyaloid body, while conforming in other respects to the general rules for depression. *This modification*, revived some years subsequently by Ferrein, who declared himself the inventor of it, was afterwards supported by Henkel, Gunz, Gentil, Walsbom, &c. In allowing the anterior capsule to remain intact, it was to reestablish the vision more completely than by the ordinary process. It was maintained that in falling upon a convex membrane the luminous rays would scarcely feel the loss of the crystalline: that the concordance of the focus of vision would be preserved; and that we should not in fact be under the necessity of using spectacles after the operation. To these reasons, practitioners objected that the capsule is frequently itself the seat of cataract, either alone or conjointly with the crystalline; that more often still it becomes opaque afterwards, and produces a secondary membranous cataract, should we fail to destroy it at the time of the operation; that consequently, so far from preserving it, we ought to endeavor to break it up as thoroughly as possible; finally, that in depositing the crystalline exclusively in the vitreous humor, in place of simply depressing it into the posterior chamber, we should run the risk of producing serious accidents.

2. *Process of the author.*—The last objection raised by the adversaries of Petit is the only one destitute of foundation. If the laceration of the vitreous body were dangerous, the operation for cataract by depression would scarcely ever succeed, for it is almost impossible to be avoided. Should not the crystalline enter, to some extent, in spite of the operator, into the vitreous humor, can it be supposed that it would ever remain depressed, pushed back as it continually would be by the natural elasticity of the hyaloid membrane? Moreover, in causing it to glide between the coats and humors of the eye, how could we avoid lacerating the retina? Proceeding upon this idea, M. Bretonneau has deemed it advisable to adopt the process of Petit by modifying it; that is to say, that in place of opening the capsule posteriorly, this surgeon, after having traced out a passage for the crystalline into the vitreous humor, proceeds to the rupture of the capsule in front as by the ordinary process. Being a witness of the successes obtained by this process at the Hospital of Tours, in 1818 and 1819, I have adopted it without having had any reason to regret it. I perform it in the following manner: the needle is directed as if to pass behind the cataract; when it has arrived at about four lines of depth, before changing its position, we incline it downwards, backwards, and outwards, in order to open into the anterior cells of the vitreous humor; immediately afterwards, we turn its back towards the iris; then while ele-

vating its handle, we cause its point to pass under the lower border of the crystalline, that it may afterwards be conducted into the pupil; then lacerate the anterior layer of the capsule; seize the opaque body, and push it by a well regulated vibratory movement, in the direction of a line which would extend from the great angle of the eye to the mastoid process on the same side. We thus avoid wounding the iris; the elasticity of the vitreous humor, though sometimes quite considerable, cannot however offer the least degree of resistance, and enables the cells of its membrane, while immediately closing the passage, to become an obstacle to the reascension of the crystalline.

3. *Another process.*—I have often also employed another process which has appeared to me to be very convenient. In place of inclining the needle downwards, I direct it upwards, and from behind forwards, in order to bring it above and in front of the crystalline, and into the pupil. By this means we more completely detach the cataract, and nothing is more easy afterwards than to force it backwards and downwards.

4. An itinerant oculist, *M. Bowen*, has published a method which he calls hyalonyxis, and which appears to him preferable to every other. His object is to traverse the vitreous humor from behind forwards, then to lay open the posterior layer of the capsule, and to detach the crystalline after the method of Petit or Ferrein, without interfering with its anterior envelope. For that purpose *M. Bowen* pierces the sclerotica at four lines from the cornea. The results of his practice are all in favor of hyalonyxis, for he scarcely counts two failures out of twenty operations. From this therefore we may at least conclude, that the wounding of the retina and the vitreous humor is a matter of very little consequence. I do not see, moreover, any advantage in going so far from the cornea, and there is no necessity of recalling the inconveniences to which we are exposed in not destroying the anterior layer of the capsule. Nothing moreover would prevent our avoiding it, if we desired to do so, by the process which I have adopted.

5. *M. Ruete*, (*Gaz. Méd.*, 1838, p. 677,) in causing his needle to penetrate at the *side of the capsule* on a line with the pupil, then turning the point of his instrument forwards, in order to rupture the envelope of the crystalline, and proceeding afterwards to the depression of the cataract, has in this process done nothing more than what often happens to other surgeons without their being aware of it.

6. *M. Goyrand* plunges his needle into the vitreous humor from behind forwards like *M. Bowen*, and immediately causes it to perform a circular movement upon the whole circumference of the crystalline, which latter he transfixes in order to drag it into the vitreous humor, without paying any attention to the anterior capsule. I have seen him operate in this manner with great rapidity.

7. *M. Gensoul* formerly made use of a process, which he soon after abandoned, but which *M. Roux* has since thought proper to make trial of at Paris, and the idea of which seems to belong to *B. Bell* or to *M. Giorgi*. A small incision is first made behind the iris, at the union of the sclerotica with the cornea. The surgeon introduces through this opening, a sort of scoop to the fore part of the

crystalline, which he pushes down or depresses, and the operation is thus terminated. The only advantage from so large an opening of the sclerotica, would be in giving relief more easily than by a simple puncture to the too great degree of fullness of the eye, (*trop plein de l'œil.*) But the division of the ciliary body, the possible escape of the humors, and the impossibility of carrying the cataract sufficiently far backwards, would of themselves suffice on the face of them to cause this process to be forever proscribed, though even the trials of its inventors and of M. Roux, did not come to our assist- to demonstrate its inconveniences and dangers.

8. *Reversion or Reclination.*—Since the time of Pott, some authors, among others Willbourg and Schifferli, have maintained that in place of depressing the crystalline, it would be better to effect its reversion. We cannot deny that this modification would render the operative process both more simple and more easy. When the needle has lacerated the anterior capsule, all that is necessary is to apply it a little nearer to its superior than to its inferior border, in order that by pressing upon it, the reversion of the lens may be effected at the moment by an oscillatory movement, which places its anterior surface above, and its superior border behind. If we desired, moreover, to drag the cataract into the substance, or below the vitreous humor, as Beer, Weller, and others recommend, reversion evidently becomes the usual mode of depression, whereas, if we should abandon it in the posterior chamber, below the centre of the pupil, it is clear that it will in most cases reascend, or that its presence would irritate the iris and the rest of the eye to such a degree as to give rise to accidents. Reversion then, is only a dernier resource, and never a process of election.

9. *Discision or breaking up.*—Pott, after having endeavored to demonstrate that the crystalline, when it is once placed in immediate contact with the aqueous humor, is dissolved, and ultimately disappears, wished also to prove that it is not indispensable to depress it below the axis of vision; that it is sufficient, as Warner had advanced, to reduce it into fragments; that in fact, as Ware pretends, a cure may be effected by rupturing its capsule. Experience has occasionally confirmed this opinion, for the examples of solution and absorption of the crystalline, whether it was left entire or broken up into fragments, are not uncommon. As on the other hand, the breaking up of the crystalline relieves us of the most difficult point of the operation, it is very natural that M. Cappuri, (*Paccini, Bull. de Ferrussac, t. XIV., p. 192.*) as well as many other oculists, should have adopted the opinion of M. Adams, who recommends that it should be made use of in all cases. Nevertheless, I will say of this the same thing that I would of reversion. It is a process which is to be adopted when the cataract is soft or too difficult to be displaced, but it is one which, notwithstanding the eulogiums bestowed upon it by M. Parmi, is less certain than depression properly so called. If it is true that the fragments of the crystalline are sometimes dissolved with sufficient rapidity, it is also true that very frequently they remain there for months, and even to an indefinite period, and in such way as to prevent the re-establishment of vision. If the wounding of the vitreous humor is thereby less difficult to be avoided, that of the



iris is ordinarily more so. Upon the supposition that there might be some advantages in leaving the cataract to be gradually absorbed, they will be found more than counterbalanced by the anxiety of the patient, and the loss of time which must elapse between the moment of the operation and the period when the pupil is again restored. I am still less capable of comprehending M. Lowenhardt, (*Gaz. Méd.*, 1838, p. 812,) who has had the temerity to pass a seton through the crystalline in order to cure the cataract, and who declares that he succeeded! All the needles are good for effecting discision. That of Beer, or M. Lusardi's small needle, in the form of a sickle, seem more convenient, however, than those of Hey and Dupuytren, and even than those of Scarpa and M. Bretonneau. Although we may break up the crystalline by attacking it on its posterior surface, it is, nevertheless, preferable to act upon its opposite surface, in order that we may be better enabled to see what we are doing, and to be more certain of avoiding the iris. In this mode, when the instrument has once arrived in the pupil, and that the capsule has been properly ruptured, we direct its point and one of its cutting edges upon the middle of the cataract, which latter is divided at first into two parts, in order to return upon each fragment separately, in order that they may be reduced into as small particles as possible, after which we endeavor to push the largest of them into the anterior chamber, by means of the back of the needle. When we operate from behind forwards, and employ the straight needle, the breaking up of the lens is in reality more easy, so long as the anterior layer of the capsule remains entire, because the crystalline being then shut up as it were in a sac, and unable to escape, is compelled constantly to present itself to the action of the instrument; but the vitreous humor suffers much more than by the other process, and it is very rare, moreover, that the lens and its envelope are not pierced through and through at the very first movements.

III. *Keratonyxis*.—Depression, reversion, and broiement, which are generally performed, as we have just seen, by scleroticonyxis or by sclerotico-hyalonyxis, are also accomplished by keratonyxis, that is to say, by penetrating through the transparent cornea. This process, whose invention has been disputed by many moderns, is far from being new. Avicenna speaks of practitioners who first opened the cornea and penetrated by that means to the crystalline, which they afterwards depressed by means of a needle that they denominated *al-mokadachet*. Abu'l-Kasem asserts positively that he adopted this method, and that when the needle is plunged into the crystalline, some gentle movements are required to be made upon it in order to depress the cataract. M. Herbeer (Carron du Villard, *Oper. de la Cat.* &c., p. 11, 239,) affirms that this has been the practice in Egypt from immemorial time, and M. Souty, (*Ibid.*, p. 241, 1834,) makes the same remark of the medicastres of India. Manget also relates the case of an English woman, who cured cataract by piercing the cornea. In the collection of Haller, we find a thesis supported by Col. de Vilars, under the presidency of Le Hoc, in which this operative process is much extolled.

It is in this manner, says the author, that birds recover their vi-

sion by plunging a thorn into the eye, and it is thus, according to Galen, that goats have pointed out to man the manner of operating for cataract. In the 18th century, Smith had already revived the process of the Arabs. Dudell, the disciple of Woolhouse, considering cataract almost always membranous, proposes that we should penetrate the cornea to reach the anterior capsule, and to remove from it a circular disc by means of the needle, in such manner as to form there a sort of window to give passage to the rays of light. The famous Taylor and Richter frequently performed keratonyxis in cases of milky cataract. Gleize in France, and Conradi in Germany, made it known in the year 1786. In 1785, Beer had performed it twenty nine times. Demours had performed it in 1803, the epoch at which Reil had endeavored in his lectures to call attention to it, and when he gave it the name which it bears. But it has required no less than the united efforts of Buckhorn in 1806 and 1811; Langenbeck, in 1811 and 1815; Dupuytren, Guillé, and Walther in 1812; Wernecke, in 1823; and Textor and Pugin in 1825, to assign it a place among regular operations.

*a. Operative Process.*—The patient and the assistants are placed in the same manner as for scleroticonyxis; the surgeon directs the point of a curved needle, that of M. Bretonneau, for example, or that of M. Langenbeck, which, though more pointed, has a cutting edge of less extent, at about a line from the sclerotica; supports the back of it upon the finger which depresses the lower eyelid; causes it to penetrate into the anterior chamber at the lower or external part of the cornea; arrives in the pupil; then turns downward the concavity of his instrument, which up to this moment he had held in an opposite direction in order to avoid the anterior surface of the iris; freely lays open the capsule; detaches the crystalline; hooks its upper border; depresses and reverses it; endeavors even to push it below the pupil into the vitreous humor, or what is better, comminutes it, and breaks it up and depresses its principal fragments when he cannot bring them into the anterior chamber; and afterwards turns the back of his needle downwards again, and withdraws it by making it pass through the same track in an opposite direction to that by which it was introduced.

*b. Appreciation.*—Keratonyxis should not be attempted until we have previously produced a sufficiently extensive dilatation of the pupil, the borders of which nevertheless it is very difficult in spite of this precaution, to avoid wounding severely, when we are endeavoring to depress the crystalline. It is to obviate this inconvenience, and especially in order not to puncture the iris, that straight needles among us have generally been proscribed, and that we penetrate at some distance from the sclerotica, taking care at the same time not to approximate too near the centre of the cornea. The pyramidal needle of Beer, the shoulder that M. Graefe has caused to be added to the stem of the ordinary needle to prevent its penetrating too deep, the needle of Himly, and that of Schmidt, &c., do not in reality present any advantage over those which are used in France, and require no further description in this place. In animals this process is preferable to all others, for reasons which it is unnecessary for me to point out. Though in the human species it may in fact be em-

ployed wherever depression is practicable, it is not advisable to make choice of it except for milky cataract, and in children and intractable subjects, and where the eyes are very movable and irritable or deeply depressed. The same hand will answer for both eyes; no nerve or vessel incurs any risk of being wounded. The retina remains intact; nor is the iris in more danger than by the posterior method. The tissues that are traversed have scarcely any sensibility, nor does the membrane of the aqueous humor, which MM. Wardrop, Langenbeck and Chélius appear to have so much dread of wounding, possess any more than a very slight degree of vitality. The operation then resolves itself definitively into a simple puncture, and may be repeated a certain number of times without any serious inconvenience. But to these advantages no less numerous objections may be opposed. The adhesions of the capsule, the contraction of the pupil, the narrowness and flattened form of the cornea, the projection of the iris, and hard gypseous or stony cataracts, do not appear to be adapted to it. Properly understood, it is for the breaking up and reversion of the lens only that we may sometimes have recourse to keratonyxis. Though it has succeeded in seven times out of eight with M. Textor; that in many hundreds of patients, M. Smalz, according to M. Eccard, has never seen it produce suppuration of the eye; that out of 345 cases of M. Walther, he failed only in twenty-six; Dupuytren, in one out of six; and M. Langenbeck, in four only out of 112, this process nevertheless has been abandoned as a general method, by even its warmest partisans themselves. M. Wedmeyer, who has performed it fifty-three times, rejects keratonyxis as well as M. Langenbeck, and M. Schindler, (*Bull. de Fér.*, t. X., p. 352-354,) who prefers in this operation to pass through the centre of the cornea, will not succeed in giving it any great degree of popularity. Nor do I think that M. Pauli, (*Arch. Gén. de Méd.*, 1838, t. III., p. 352,) who, penetrating at the cornea, then divides the vitreous humor above the crystalline in order afterwards to perforate through this opening through the entire body of the lens, will ever succeed in causing his method to be adopted. Nor can I comprehend any better the superiority of what M. Quadri (*Gaz. Méd.*, 1833, p. 643) calls his *mixed method*. How is it possible that a sort of *forceps-needle* introduced through the cornea in order to extract the capsule of the crystalline, while the cataract is being depressed by means of an ordinary needle passed through the sclerotica, could render the operation more simple, more sure and less dangerous? I conclude therefore that keratonyxis cannot be substituted for scleroticonyxis, which alone enables us to push the crystalline without extracting it, outside of the visual axis, and to fix it there securely, promptly and permanently; and that in fact it only deserves a place in books of surgery under the character of an exceptional method.

c. As to the simple *puncture of the cornea*, as formerly practiced by Lehoc, and more recently by M. Wernecke with the view of promoting the solution or absorption of the cataract, it has not yet sufficient proofs in its favor to authorize its being formally recommended. If nevertheless, as cannot be doubted, the decomposition of the crystalline separated from its membrane, is a phenomenon much more chemical than vital, we cannot see why the evacuation of the aque-



ous humor, when once impregnated with the foreign substance, might not favor the dispersion of the cataract, in permitting the liquids with which it is surrounded to be renewed.

IV. *Operation for Cataract in Children.*—In the early period of life, we can scarcely have recourse to the method of extraction. We should rarely succeed in accomplishing it without emptying the eye. As is demonstrated by the observations of Scarpa, Ware, Saunders, Gibson, M. Lusardi, and M. Lawrence, who has seen it in four brothers, &c., congenital cataract and accidental cataract in young persons are almost constantly liquid and membranous. There is consequently but little to do with depression or extraction. The object to be attained is to lacerate as completely as possible, the anterior disc of the capsule, and to empty it of the matters that it contains. In such cases it is a matter of indifference whether we operate by keratonyxis or scleroticonyx, at least when the pupil is very large, a condition which ordinarily exists. The most difficult point is to restrain the little patient. Ware confines himself to placing him upon a table, raising his head by means of pillows, keeping him held down by assistants, and holding the eye steadily by means of the fingers, while another assistant raises the upper lid with the elevator of Pellier. Gibson, who first gives an anodyne potion to blunt the sensibility, causes the most intractable to be imprisoned in a sort of sack, open at both ends, and which is confined above the shoulders and below the feet by means of a running string. Finally, M. Lusardi finds it more commodious to seat the child upon the angle of a prepared table, after having fastened his arms around his trunk and placed his legs between the thighs of the operator. Whether we penetrate through the cornea or the sclerotica, it is always important to effect a complete loss of substance at the anterior disc of the capsule, and not to confine ourselves to its simple rupture, unless we wish to incur the risk of seeing a secondary cataract supervene soon after. If the crystalline should still retain some degree of resistance, and if it should appear that the capsule itself ought to be broken up into fragments, it would become necessary, as in an adult, instead of leaving them in their place, to force them into the vitreous humor or push them forward into the anterior chamber. If at the expiration of fifteen or twenty days, any fragments should remain at the place of the crystalline, Ware recommends that we should repeat the operation, without waiting any longer, and states that he has performed it four or five times successfully in this manner on the same child. Such a course of procedure ought not to be imitated, unless we have satisfied ourselves that the fragments of the cataract have absolutely ceased to diminish in volume. This perhaps would be an occasion for making trial of the process of Wernecke, and of evacuating the aqueous humor by a puncture in the cornea.

V. *Subsequent Treatment.*—When everything is finished after the operation for cataract by depression, the patients are recommended to keep the eyelids gently closed. The practice of placing before the patient some object to ascertain the result of the operation should be abandoned by all practitioners. The light arriving in full force and suddenly into the bottom of the eye, irritates the retina too severely, and such a test in every respect can only be intended to

gratify an idle curiosity. After the employment of the needle especially, it must completely fail in its object, since the disturbance we have just produced in the chambers of the eye may render the sight very confused at first, though it is to be completely reëstablished afterwards. Nobody at the present day would venture to follow the recommendation of Purmann, by applying over the puncture of the sclerotica, a small piece of gold-leaf, with the view of preventing the escape of the aqueous humor or the vitreous body.

Brandy and the white of an egg, employed by the ancients, and a thousand other topical applications lauded without any foundation, are also proscribed. We confine ourselves to wiping out the eyelids with a sponge or a fine compress, then placing in front of them the oval piece of linen perforated with holes, dry or imbued with cerate, and over these a soft compress of lint, and a bandage of linen, which is arrested under the nose by the bridle formed by its notch, and which is fixed behind to the cap by means of some pins; finally, the band of taffeta which is to cover the whole. It is important that none of these portions of dressing should be drawn so tight as to compress the parts contained in the orbit. For myself I confine myself in most cases to the employment of a simple bandeau, which bridles the nose, and which I attach to the cap behind by means of pins. The patient operated upon should make no effort nor any movement. Being carried back to his bed he is to be laid upon his back, with the shoulders and head elevated by means of pillows. The habit of surrounding him with thick and colored curtains, and of allowing but little light to penetrate into his chamber, has appeared to me to be more hurtful than useful. During the space of three or four days we allow him only bouillon or light soups. If the stools are not regular, emollient clysters or even laxatives are to be administered. We may give him also, for example, a drink of a more or less relaxing character, such as whey, barley-water sweetened, syrup of prunes, veal broth, or decoction of tamarinds. However little cephalalgia, heat of skin or febrile movements, may supervene, bleeding is not to be omitted. When nausea and vomiting should at the same time be present, laudanum by injection, as Scarpa recommends, is indicated and produces very good effects. In ordinary cases the usual drink to be employed is infusion of linden, violet or wild poppy, sweetened with some syrup. Loss of sleep and restlessness are to be relieved by an ounce of syrup of white poppy or diacodium made into a julep, which is to be taken by teaspoons full. When no serious accident supervenes we do not uncover the eyes until the third or fourth day; while everything goes on well it is perfectly useless to examine them before that time. Should any accident occur we should be apprised of it by the state of the pulse, the cephalalgia, the pain in the orbit, the running of the tears and the saturation of the dressing by a yellow discharge. To perform the dressing the patient must be first seated. The different portions being removed, a basin with warm water is placed under his chin, and by means of a sponge he himself moistens and separates his eyelids, which he immediately opens after the operator has wiped them. At this time the curtains are to be closed. Even though the pupil should appear to be regular, it is scarcely yet prudent to undertake to ascertain the extent to which the sight

is re-established. The dressing is to be reapplied and renewed every day, and we proceed in the same manner as in cases of simple ophthalmia, while the eyes retain their redness. If everything goes on well we allow at every dressing a little more light to fall upon them, in such manner that at the expiration of twelve to fifteen days they may be left uncovered and protected only by a simple shade of dark taffeta. Nor is there any longer any necessity of the diet being very rigid, and the patient may get up in the course of the second week, resuming by degrees his customary regimen. I have frequently even made them or allowed them to get up at the beginning of the fourth day. Under a contrary state of things, we must look to the kind of symptoms which are developed, in order to employ in good season, antiphlogistics, general or local, purgatives, revulsives, and collyria, of this or that description, in the same way as we would do in a disease of the same kind produced by any other cause, not forgetting at the same time that iritis, retinitis, and choroiditis are under these circumstances the accidents that we are especially to endeavor to prevent or to combat.

*D. Operation for Cataract by Extraction.*—Cataract was still but very imperfectly known, both in respect to its seat and its nature, when it was already proposed to extract it. Antylus, according to Sprengel, opened the cornea by means of a needle, and proceeded to seize hold of the opaque pellicle through the pupil, in order to extract it. Lathyrus operated in the same manner. It appears also that Galen practised incision of the cornea in front of the membranes, in order to extract the cataract. Ali Abbas and Avicenna speak of extraction as a common method. Abu 'l Kasem states that he learned from an inhabitant of Irack, that in that country the practice was to introduce a short needle into the anterior chamber in order to void the cataract. Avenzoar and Isa Ebn-Ali, who reject it, state that in their time it was in general use in Persia. G. de Chauliac himself has not forgotten it; and Galeatius, who extols it greatly, gives himself out as its author. Entirely forgotten, however, or laid aside, by the authors of the middle ages, the operation for cataract by extraction does not appear to have been revived in practice until about the end of the seventeenth century and the commencement of the eighteenth. In 1694, Freytag laid open the cornea in the manner of the Arabs, and succeeded afterwards in extracting from the eye an opaque membrane, which doubtless was no other than the anterior layer of the capsule of the crystalline. Woolhouse passed through the anterior chamber with a needle arranged in such manner as to be susceptible of being transformed at pleasure into a forceps, and which enabled him afterwards to seize hold of the opaque body in order to effect its extraction. Petit, effecting, in the presence of Méry, the extraction of a cataract which had fallen into the anterior chamber, surprised many of the assistants by showing to them an opaque crystalline in place of the pellicle they had expected to see. St. Yves also decided upon extracting the crystalline lens, but without success, which induced him, but we do not see for what reason, to maintain more strenuously than ever that cataract does not have its seat in the body of the lens. These different attempts had then scarcely attracted any attention when Daviel, in 1748, submitted



his method to the judgment of the Academy. By means of a large instrument shaped like the tongue of a carp he opened into the lower part of the cornea; the wound in which he afterwards enlarged by means of a second instrument narrower than the first, or by small curved scissors. A gold spatula to keep the lips of the wound open; a needle of the same metal, which was flat and triangular, for the purpose of opening the capsule, and a scoop to favor the issue of the crystalline or its connections, were also necessary to this surgeon. A crystalline which had fallen into the anterior chamber, had obliged him to put his process in practice for the first time in 1745. One hundred and twenty-two cures out of two hundred and six operations, as announced by him, made a vivid impression on the public mind; and although the Caqué of Reims had mentioned only seventeen successful results out of thirty-four operations, every body, nevertheless, was anxious to repeat his essays. *Pallucci*, who professed, in 1752, to have performed extraction before *Daviel*, opened the cornea from the small to the great angle of the eye by means of a knife, the apex of which being very much elongated, resembled a kind of needle. *Poyet* devised a narrow instrument, pierced near its point in order to pass through this eye a noose or thread, which would be capable of supporting this organ while the flap of the cornea was being made from above downwards. *La Faye* proposed to substitute for all these instruments of *Daviel*, a knife in form of a lancet, somewhat narrow, slightly convex on one of its sides, and the back of which was blunt up to near its point. To these he added a cystotome, a sort of triangular lance, supported by a padded spring, (*ressort en boudin*.) and enclosed in a sheath which was dilated in its middle in such manner as to resemble the body of a syringe. *Beranger* soon after modified the keratotome of *La Faye*, gave it more breadth, rendered it flat on one side, convex on the other, and much thicker, especially on its back. *Sigerist* gave still greater length to the point of *Pallucci's* knife, in order to open into the capsule by traversing through the anterior chamber. But *Jung* has remarked, with great propriety, that a cataract needle is much better than any particular kind of cystotome for this last stage of the operation. It was during this state of things that *Richter*, who appeared in Germany, *Wenzel* in France, and *Ware* in England, definitively established the rules for the method by extraction. Two methods have been proposed for extracting cataract. One, but little known in France, bears the name of *scleroticotomy*; the other, almost the only one in use, is called *keratotomy*. The same *preparatory steps* are applicable to them. The pieces of dressing are similar to those which are required for depression. Nevertheless the position of the patient, assistants and operator, require still more exact precautions than in this last method.

It is for extraction especially that *Richter* and *Beer* urge the necessity of a chair with a solid and vertical back, against which they assert it will always be more easy to keep the head of the patient immovable, than by supporting it against the chest of an assistant. The horizontal position proposed by some, and extolled by *Rowley* and *Pamard*, is nevertheless but rarely adopted; doubtless, because it is a little inconvenient for the surgeon. I have often made use of

it, and do so daily, and I confess I never have been able to comprehend why it is not more frequently had recourse to. In that case, it is necessary for the surgeon to place himself upon the side of the eye affected. Should it not, however, be adopted, and that it should be thought preferable to place the patient on a chair, it is, if not indispensable, at least more convenient for the surgeon to stand up than to be seated before him. The speculum devised by F. Aquapendente, still employed by Sharp, and modified by Heister, the instrument of Van Wy (Arrachard, *Dissert.*, &c., p. 69, 106, Paris, 1805,) the ring of Bell or Assalini, which M. Lusardi has placed upon a handle and reproduced under a new form; the erignes of Sommer, and all the other instruments invented to separate apart, elevate or depress the eyelids, which are useful when we have not a sufficient number of expert assistants, are advantageously replaced by the fingers. Almost all of them incur the risk of compressing or of emptying the eye. The same remark may be made of *ophthalmostats*, among which are to be mentioned the forceps of Ten-haaf, the pique, the stem of which Casamata caused to be curved into an S, in order that it might be better accommodated to the form of the nose, which Rumpelt attached to a sewing thimble, in order to use the middle finger while the forefinger of the same hand depresses the lower eyelid, and to which Demours wished to add another modification by mounting it upon a thimble open at its two ends. The trefoil (*tréfle*) of Pamard, such as the son-in-law of the inventor made known in 1825, is liable to nearly the same objections. I find it less dangerous, however, than to apply the two first fingers of the assistant and the operator in the great angle, as is recommended by Ware, to prevent the eye from inclining inwards, and to compress it up to the moment at which the knife terminates the flap of the cornea. The species of elevator, the kystotome forceps, the double keratotome of M. Martin, the instrument contrived by M. Bonnefin (*Thèse*, No. 41, Paris, 1837), are doubtless constructed with sufficient ingenuity, but may be too easily dispensed with to make their utility a matter of importance with surgeons. The ophthalmostat of M. Fardeau (*Journ. Hebd.*, 1835, t. IV., p. 117,) differs from that of M. Lusardi in this, that in place of a prominent arc, it carries on its ring a kind of large concave and blunt nail (*ongle*). That which I have proposed, (Estevenet, *Journ. Hebd.*, 1836, t. II., p. 147,) has some analogy with the ancient probe of Segwart; resembling in its handle the ordinary keratotome, it is composed of a small plate of shell, slightly curved on its flat side, and which, moreover, represents the scoop of Daviel. Being perfectly blunt and destitute of any kind of roughness, this plate irritates the parts in no respect whatever. As soon as the point of the knife has passed through the cornea at the side of the great angle I glide this instrument below and between it and the sclerotica, in such manner, that by holding the eye immovable in that position, I render it impossible for it to become displaced inwards, giving at the same time a point d'appui to the keratotome, which allows me every liberty desirable for completing the section of the cornea.

I. *Scleroticotomy*.—B. Bell, after making some trials upon the dead body, averred that it was full as easy to extract the cataract by the

sclerotica as through the cornea. This idea, the first application of which upon living man was made by Earle, and which was revived by D. Lebel and M. Giorgi, has been definitively adopted by M. Quadri, of Naples, who founds upon it his new method or that of scleroticotomy. An incision of about three lines in length is first made by any keratome whatever, upon the sclerotica at two lines from the cornea. The crystalline and its envelope are then seized hold of by means of a small pair of forceps, and the whole extracted through the outer angle of the eye. In proceeding in this manner, M. Quadri affirms that he failed but in four instances out of twenty-five operations. The first stage of the operation is less difficult, and exposes perhaps to fewer immediate accidents than the ordinary method, nor can it be very difficult to seize hold of the cataract; but how can it be embraced with sufficient firmness to enable us to bring it through the opening of the sclerotica without emptying the eye? How can it be believed that so large an incision through the three principal coats of the eye, will not, in a majority of instances, be accompanied by an internal hemorrhage, wounds of the ciliary nerves or vessels, and followed by accidents a hundred times more serious than those which take place after the opening through the transparent cornea?

II. *Keratotomy*.—Extraction, properly so called, is composed of three different stages: the incision of the cornea, the opening into the capsule, and the expulsion or extraction of the crystalline through the incision whether made upon the inferior or superior half of the eye. The *instruments* employed to effect this have varied considerably, and are far from being the same with all operators. In France, they freely employ the knife of Wenzel, the inventor of which, Richter, (*Bibl. Chir. du Nord*, p. 212,) has so severely censured, and which differs from that of La Faye only in this, that neither of its sides is more convex than that of the other. Some practitioners however prefer the keratome of Richter, the blade of which, which is very pointed, expands from the point towards the handle in such a manner that it may divide one half of the segment (limbe) of the cornea while traversing the anterior chamber. That of A. Pamard resembles half a myrtle leaf, and has, upon its upper border, which is straight and blunt, a small rib, in order to increase its force. Ware's knife, which is generally employed in England, is almost in every respect similar to that of Richter, and the instrument of Beer, so much praised in Germany, differs from it only by the shortness of its point, and in having a little less degree of length in its blade, which latter, moreover, is somewhat broader. Béranger has proposed one which is convex on one side, flat on the other, and somewhat broader than that of La Faye. Lobeinstein gives it still greater breadth, and slightly elongates its point. Under this form, its convex side, turned backwards, protects the iris, while its plain surface glides behind the cornea. This knife, slightly modified by B. Bell, has since been improved by Jung, one of the most skillful cotemporaries of Beer. According to Sprengel, the keratome of Jung, which is convex on both sides, and cutting on both its edges, is very short and somewhat broader than is necessary to divide with one stroke half the circle of the cornea. According to M. Harel, on



the contrary, the knife should be like that of Lobstein, convex only on its posterior side, and should resemble a kind of guillotine. Finally, that of Barth is distinguished from the preceding by the small notch which is found near its back on one of its sides. The important point in the midst of so great a number, is to choose an instrument whose form and dimensions will enable us to divide completely the half of the cornea, in traversing the anterior chamber, without giving egress to the aqueous humor while the knife remains in the wound. To effect this object, its blade, being of a triangular form, ten lines in length, at least three lines in breadth near its heel, and slightly convex on both its sides, ought to be somewhat thicker at its back than near its cutting edge, and should gradually increase in thickness from the point to the handle. In this respect, Richter's knife, somewhat shortened as Beer has recommended, appears to me to deserve the preference over all the others. I have had constructed a carp's tongue, four lines broad at its heel, six lines long, terminated by a point somewhat tapered, and which is more convenient for laying open the cornea than the lance of Daviel. An instrument which is longer, of less breadth, and with a point more projecting, has been proposed by M. Furnari for the same object. It is however perfectly understood that we may, if necessary, make use of a simple lancet, the little sickle-shaped knife of Sharp, a very sharp-pointed bistoury, or, in fact, any cutting instrument whatever. The point under these circumstances is, which is the best, and not what is of absolute necessity.

The *second stage* has also attracted much attention from surgeons. The needle of Thuraud, the lancet of Tenon, those of Hellmann and Grandjean, Mursinna's probe, and the kystotome of La Faye himself, with or without the modification of M. Rey or M. Bancal, are generally abandoned. The serpette of Boyer would have also fallen into disuse, if the scoop of Daviel, which Dusaussay (*Gaz. Salut.* 1786, No. 29, p. 3.) considers that he has improved, and which is still sometimes made use of, was not mounted upon the same handle. Small and straight forceps, having a small hook at their extremity, like those of Reisenger; the erigne forceps of Blaemer, or the tooth forceps of Beer; in fine, an ocular forceps, such as are found at every cutler's; a hook-needle; a small spatula or gold scoop, and Anel's syringe in case of necessity, and which are useful, either for detaching or afterwards removing any fragments of capsule, of membrane or of crystalline; ought also to be placed by the side of the knife on the operating table. In a woman on whom I operated for a *black cataract* at the Hospital of La Pitié, the capsule was so thick and so firm, that it resembled in almost every respect the cornea, causing me a vast deal of trouble to open into and to extract it, for which cases the instruments could not be too sharp. An ossified crystalline, as in the case cited by M. Middlemore, (*Transactions of the Prov. Assoc.*, vol. VI.; *Revue. Méd.* 1838, t. III., p. 269,) would not be more difficult of expulsion than any other. It is probable, however, that if the cornea or vitreous humor were indurated, as in the patients of M. Wardrop and Kulm, the operation for cataract would hardly be thought proper.

*a. Inferior Keratotomy.—1. Ordinary Process.—First Stage.—*

The patient and the assistants being properly arranged, the surgeon depresses the lower lid with the forefinger, which he at the same time presses against the caruncula lachrymalis, in order to support the globe of the eye on the inside; seizes the cataract knife with the other hand; directs its point at a line or half a line in front of the sclerotica, while taking with his little finger a point d'appui on the temple; then plunges the instrument immediately into the anterior chamber perpendicularly to the axis of the cornea, a little above its transverse diameter, and at the side of the outer angle of the eye; immediately inclines backwards the handle of the knife, whose point without this precaution would not fail to wound the iris; then pushes it horizontally with firmness, and without any shaking, to a point diametrically opposite of the cornea, which he again pierces, but from the interior to the exterior; makes it advance upon this line without pressing upon its cutting edge; takes care never to withdraw it towards the outside, and that one of its sides should be exactly parallel to the anterior surface of the iris, while the other looks towards the front part of the eye, until in the progress of its track it has entirely divided the inferior semicircle of the cornea, as near as possible to the sclerotica, that is to say, at a line or half a line from the greater circumference of the iris. It is at the moment when the keratome terminates this section, that the slightest pressure would be particularly dangerous, and which it is important therefore to avoid, as far as it is in our power to do so. At the same instant, therefore, the assistant is to let go his hold upon the eyelid, which the patient, to whom some few moments are accorded to recover himself from his emotion, gently closes.

*Second stage.*—After having carefully wiped out the vicinity of the orbit, the surgeon raises up the eyelid or causes it to be raised a second time, taking particular care not to touch the globe of the eye; presents with the other hand the back of the kystotome at the most depending point of the wound; penetrates in this manner to above the pupil, whose superior semicircle he passes around by preference from one side to the other, and in such manner as freely to divide the crystalline envelope with the point of the instrument whose concavity is to be turned downwards. When the two eyes are to be operated upon successively, the surgeon rests here for the first, in order not to return to it, until after having opened the cornea and capsule of the second.

*Third stage.*—If the cataract does not of itself pass into the anterior chamber, its expulsion is to be favored by means of gentle pressure properly applied. The operator pushes the left forefinger against the lower part of the eye. With his right hand he places the handle of the keratome or the back of Daviel's scoop, transversely, upon the upper eyelid, in order to execute while making pressure, slight movements backwards and forwards, upon a level with the ciliary circle, in the direction of a line which would reach from this point to the union of the two anterior thirds with the postero-inferior third of the sclerotica, in passing from above downwards between the crystalline and the vitreous humor. Immediately the lens is seen to pass through the pupil, and to present itself by its border, at the wound of the cornea, which it escapes from, or from which we force it to escape

by gradually directing upon it the pressure from above. We then remove it with the scoop, needle, or point of the knife, when the operation is usually found to be terminated.

*Fourth stage.*—If opaque fragments of the capsule, of such large size as to compromise the success of the operation, should be found to be left behind, they are to be seized hold of and extracted with the forceps. Any other fragment should be removed in the same manner, should the spatula or the scoop prove insufficient. As to those which become arrested in the anterior chamber, unless they should be of a certain volume, it would be much better to abandon them to the dissolving action of the humors, than to irritate by repeated trials with Daviel's scoop, the posterior surface of the cornea. The same remark may be applied to the diffuent layer which is sufficiently often detached from the crystalline, when it escapes into the anterior chamber, and remains adherent to the environs of the wound. Whether the contact of the instrument with the membrane of the aqueous humor inflames this lamella, as Sommer has asserted, or whether it is detrimental in any other way, certain it is, that a manœuvre of this kind is frequently followed by a complete and speedy opacity of the cornea. Warm water injected into the chambers of the eye with Anel's syringe, as Forlenze was in the habit of doing, would evidently be much preferable. As to the dangers of air, which according to M. Maunoir, (Carron du Villards, *Oper. de la Catar.*, p. 156, 216,) gets into the eye in place of the crystalline, making it necessary to fill the anterior chamber with distilled water to drive out this gas, I must differ in opinion from the skilful surgeon of Geneva.

2. *Remarks.*—In place of commencing the *incision* exactly at the extremity, or a little above the *transverse* diameter of the eye, *Wenzel* recommends that the knife should be directed upon the middle of the outer and upper fourth of the cornea, and that it should be made to come out at the same point on its lower and inner fourth. His reason is, that by this mode the root of the nose runs less risk of being wounded, and that the wound being oblique, the eyelids forced in closing to conceal its two extremities, cannot either of them become entangled between its edges. This precept, which is generally recognized in France, is far from having attracted as much attention in other countries. In Germany, for example, it is so little known, that *Weller*, who advises it, appears desirous of appropriating the mode to himself. We should be wrong, perhaps, not to adopt it when the eye is large and projecting, because under such circumstances, the lower palpebral border in fact might have a continual tendency to open the lips of the wound; but in other cases, the advantages which are attributed to it, certainly originate much more from theoretical ideas than from practical facts. The puncture of the inner angle of the eye is a matter of too little consequence to be regarded, and the natural pressure made by the upper eyelid usually suffices to prevent the separation of the edges of the wound, whether it be transverse or oblique. Then again, the projection which usually exists in most persons in the outer orbital process, and that of the superior maxillary bone near the ascending process, cannot but have the effect to impede the march of the instrument, and of in-



curing the risk of making such tractions upon the eye, as to endanger the expulsion of the vitreous humor. Between the two angles of the eye, nothing similar is encountered. When judged necessary, it is generally under such circumstances practicable even to incline the handle of the keratotomy towards the temple beyond the transverse axis, without making severe tractions on the eye. In incising at less than half a line from the cornea, it would be with difficulty that we could avoid the iris; at more than a line we should have to apprehend that after the cure, the opacity of the cicatrix would be brought too near the centre of the pupil. A stage which students have most difficulty in comprehending or executing properly, is that which consists in falling perpendicularly on the eye. It is, however, a point of the highest degree of importance. If we approach more to the horizontal line, the point of the instrument, almost always becoming entangled between the laminae of the cornea, works itself obliquely through them, and sometimes does not reach into the anterior chamber, but at a line and a half from its entrance, making in reality but a small aperture, though in appearance the wound is very large.

To attain the object desired, the surgeon must not lose sight of the position of the eye, and that according as this organ is more or less turned inwards, he must always present the instrument to it from before backwards, and from without inwards, but more or less inclined towards the temple or towards the face. We should also at the same time recollect that the cornea being curved upon a cord shorter than the sclerotica, there must exist in front of the union of these two membranes a slight circular excavation, which causes its perpendicular to be a little less inclined forwards as compared with the diameters of the body of the individual, and the perforation more easy. As soon as the *knife has entered into the anterior chamber*, its cutting edge must be kept downwards as accurately as possible, in order to avoid the ciliary circle and iris behind, or having a cicatrix too near the centre, should it be inclined forward. At the moment when its point is about to emerge at the side of the caruncula lachrymalis, it would, should it not be directed a little towards the anterior plane, bear too much upon the sclerotica, and might again wound the cornea. As soon as we have commenced inserting it, it is important not to give it any retrograde movement until it has completely traversed the eye. The gradual increase of its thickness and breadth, enables it to fill up the wound exactly, from whence it follows that the aqueous humor does not flow out till at the end. However little it may be withdrawn, on the contrary, it leaves necessarily a void from whence this liquid immediately escapes. The iris then protrudes forward, and may be easily wounded. The rule is, that we should detach the half of the circle of the cornea. A smaller wound would render the expulsion of the crystalline difficult, especially should it be of a large size, and would necessitate dangerous pressure. Should the wound be greater, there could be but little inconvenience in it. Were extended it to two-thirds of the cornea; but though in such cases gangrene of the flap, dreaded by Maunoir, can scarcely be apprehended, it is nevertheless unnecessary to go so far. Should it be necessary to enlarge the incision of the cornea, the

instrument in form of a double lithotome, devised by M. Carron du Villards, (Marini, *Bull. de Therap.*, t. VI., p. 282,) might be serviceable, and would readily enable us to attain our object. When the *eye obstinately continues at the vault of the orbit*, the trefoil of Parnard may be required to render the process of extraction practicable; if it is concealed at the great angle of the eye, we may sometimes bring it out by means of the finger directed upon the caruncula lachrymalis; and better still, with the scoop (curette d'ecaille) which I am generally in the habit of using. It could be fixed without difficulty and even without danger, between the middle and forefinger of the assistant and the operator, if we could feel perfectly sure that we could suspend all kind of pressure the moment the knife had penetrated through and through the cornea, that is, a little before the definitive formation of the flap. At least I do not see any risk in proceeding in this manner, until the point of the knife arrives in the great angle. Then we are masters of the organ, and no obstacle prevents our bringing it forward, provided, however, the blade of the instrument is not displaced. In place of the *sound* or flexible probe, which were used by Pellier and Siegerist, we might, when the pulp of the finger did not appear to be capable of effecting our object, use advantageously the nail of the *forefinger*, or even of the little finger, to aid the knife in terminating the flap of the cornea. The extremity of the finger is then directed upon the great angle, in such manner that its pulp falls perpendicularly upon the inner side of the eye, at the same time that its back faces forwards and towards the median line. As soon as the keratotome presents itself, its cutting edge is placed at a right angle on the free border of the nail, as if to support it; after which, while making it pass from the external to the internal angle of the eye, the nail fixes the cornea by making a slight effort, as if for the purpose of gliding outwardly towards the heel of the instrument, until the incision is completed. The shell scoop which I am now in the habit of employing, substituted in place of the nail, renders this stage of the operation still more simple and easy.

In spite of all these precautions the *iris* will sometimes *present itself* under the cutting edge of the knife. Gentle frictions on the front part of the eye, through the upper lid, often oblige it to withdraw itself backwards, either because we in this manner favor its contractions and its narrowing, or, as appears to me more probable, because the pressure that we must almost necessarily make upon the cornea, restores it to its natural position, by forcing the liquid which is in front of the keratotome from the anterior into the posterior chamber, or perhaps because we straighten its folds by flattening the vitreous membrane. Certain it is that we never succeed better than when we apply the finger naked upon the eyelid, and moderately compress it. After all, the worst that can result from it is a second pupil; which accident has happened to Wenzel, M. Roux, and Forlenze; numerous examples of it are to be found in the works of authors. It has happened many times with myself, and I have not found that the re-establishment of the sight has been thereby interfered with. I am therefore of opinion that it is less dangerous to incur the risk of this accident, than to withdraw the knife to finish the incision with

the scissors, and that prudence, moreover, allows us to dispense with it, if in order to avoid it we expose the eye to fatiguing manipulations. *The elasticity of the sclerotica*, and perhaps also the action of the recti muscles, may quite frequently be found sufficient to expel the crystalline, which then immediately presents itself at the wound, as soon as the instrument is withdrawn, or a short time after. It is indeed owing to this fact that many practitioners have suggested the idea of opening the capsule at first, and not to return to the expulsion of the cataract until after having proceeded in the operation to the same extent upon the other eye. Bell, and after him Jung, from fear of breaking up the crystalline, have proposed to *scrape the capsule* rather than incise it. After having cut through the cornea, M. Jüngken (*Jour. de Kleinert*, Juin, 1836, p. 76,) considers that the chances of success would be augmented by removing the capsule before extracting the crystalline. It is a practice which is decidedly pernicious, and which nothing but the extreme skill of the German oculist has rendered somewhat popular. Pellier, Siegerist, and especially Wenzel, have considered that it would be better to *open* this membrane with the keratome while *passing through the anterior chamber*, than to return to it afterwards. It was an easy thing for Wenzel, who reached its anterior layer by inclining slightly backward the point of his knife, when it was passing in front of the pupil. For operators who are less experienced, it would be an exhibition of force, and an act of imprudence which might be attended with danger. The operation would be uselessly complicated by raising the flap of the cornea with a spatula, while another instrument was being directed towards the pupil. The cataract knife is rarely employed for this incision, because the iris might thereby be easily wounded. Hey's needle, the little myrtle-leaf of Morenheim, and the spear-shaped instrument of Beer, are special instruments which are replaced by the ordinary curved needle, or the serpette of Boyer, which, however, in consequence of its convex and rounded border, is much better adapted for going through the wound than lacerating the crystalline envelope. I would say the same of the instruments of M. Furnari, which, nevertheless, are constructed with considerable ingenuity. This surgeon after having incised the cornea with his lance-shaped knife, the point of which at the same time lays open the capsule, proceeds to break up the crystalline in its place, by means of a kind of small polypus forceps, which afterwards allows of expelling or extracting it without difficulty through the incision. *The crystalline escapes* readily through a puncture in the centre, or a semilunar incision at the depending point of the capsule, as well as by the numerous incisions vertical and transverse, which Beer was in the habit of making upon it, because it lacerates what makes resistance to it; but the flaps of the opening afterwards approximate, or fall back again into the visual axis, and may, should they become opaque, produce a secondary cataract. On the contrary, by placing the semilunar incision above, as I have recommended, the tearing open of the capsule is made from above downwards, in such manner that the flap which results from it must remain below the pupil. Beer, perceiving that it was sometimes exceedingly difficult to effect this destruction of the capsule conveniently,



decided upon removing it entire, either by means of a hook in cases of silicose cataracts, or by a small forceps, when it is an encysted cataract, or finally, in cases of capsulo-lenticular cataract, by means of his needle-shaped lancet. Richter, maintaining the idea, that, in depression, the capsule and crystalline are always reversed together, (*Bibl. Chir. du Nord*, pp. 269, 271,) asserts that in the operation for extraction also, it is advisable and not difficult to remove them both at the same time. Though Beer asserts that he has often followed this precept with success, he has not found, and will not find in the future but a very small number of partisans. Who, in fact, does not see that the remedy is worse than the evil; that we should succeed much better by making free incisions into the capsule than by detaching it in mass; that by these repeated movements the crystalline will, in most cases, lacerate it, and leave it remaining, so much the more so as the posterior capsular layer is not susceptible of being readily detached from the vitreous humor. It is not often, moreover, that this deep-seated portion of the crystalline envelope becomes opaque. This is fortunate, for unless it was very limited, the evil probably would be without a remedy. Even in such cases I do not know to what extent it would be allowable to follow the advice of Morenheim and Beer, by isolating the opaque point, and attempting its extraction with a hook. I do not think that the laceration of the posterior capsule in many directions, after having extracted the crystalline, as is recommended by M. Landrau, (*Arch. Gén. de Méd.*, t. XIV., p. 113,) would be a prudent course, or present the slightest advantage.

It has been suggested when the cataract was milky to give egress to the altered liquid, or when it was membranous to destroy the capsule only, in order to preserve, according to M. Jüngken, the crystalline in its place with its natural transparency; as if in liquid cataract the whole lenticular apparatus was not at the same time diseased; as if the crystalline could maintain itself with its normal conditions a moment after the capsule had been opened! Diseased or not, it should be removed in every case therefore, should there be no obstacle to our doing so. The *putrid* cataract of Schifferli does in reality exist; an instance of which I saw at La Charité in 1837. The lenticular capsule, which was of a greyish color and very much distended, extended beyond the plane of the pupil in front. The purulent matter which it contained, emitted in coming out an infected odor which surprised all the assistants. In producing a dilatation of the pupil the preparations of belladonna, which were already in use in such cases in the time of Pliny (Carron du Villards, t. II.) and Raymar (Causard, *Thèses de Paris*, &c.,) give greater facility to the egress of the vitreous humor, and may in this manner become more or less dangerous. If they are omitted the pupil sometimes remains so contracted as to interfere with the expulsion of the crystalline. In order to obviate these two inconveniences, Bischoff and others have recommended that we should first open the cornea, then the capsule, and afterwards turn the back of the patient to the light when we desire to expel the cataract. By this means the pupil, which was strongly contracted in the beginning of the operation, becomes, they say, dilated of itself, and without any danger towards

the termination. If it were necessary, we might also, say these same practitioners, not make use of any medicated applications until after the eye had been opened into; as if the pupil could then respond to the action of belladonna!

Finally, before proceeding to any active means, we must cause the globe of the eye to be moved upwards, inwards, and outwards, seeing that such movements frequently favor the egress of the opaque body. If from some cause or another the vitreous humor escapes, we must immediately close the eyelids and turn the head of the patient towards his back. This accident, which involves the complete loss of the eye when the hyaloid membrane is entirely emptied, is in the other cases much less dangerous than has been for a long time supposed. It has in fact this thing remarkable about it, that the loss of a certain quantity of the vitreous humor seems rather calculated to augment than to diminish the prospect of a favorable result for the operation. The loss of a fourth part or even a half of this liquid ought not to cause us to despair of success. There is no evidence that it is again produced; but the aqueous humor being more abundantly secreted, takes its place, and the functions of the eye scarcely suffer.

3. *Process of Guérin and Dumont.*—With the view of reducing the operation to its most simple condition, Guérin, and almost at the same time, Dumont, captain of the coast guard in Normandy, each contrived an instrument, the object of which was, by an ingenious mechanism to hold the eyelids apart, steady the globe of the eye, and complete the incision of the cornea by one stroke. The first of these instruments, terminated by a sort of ring bent to a right angle on its handle, concave behind, and shaped to the front of the eye to which it was accurately adapted, includes a cutting blade in form of a fleam, which being put into operation by means of a spring, immediately divides the half of the circle of the cornea either from below upwards or from above downwards. The ring and the handle of the second are upon the same line. Its blade has some analogy to the pharyngotome, and is to be applied horizontally, differing in this respect from the other, which falls on the eye in the manner of the cutting edge of a guillotine. The instrument of Guérin, which was suggested perhaps by the fleam of Van Wy, has been long since abandoned in France, and M. Eckhold, after having modified it, is the only person to my knowledge who has been desirous of its adoption in Germany. Though more convenient and less dangerous, that of Dumont has not met with a better reception.

4. *Guérin of Lyons.* (*Mal. des Yeux*, p. 380, 1769,) uniting the lance of Pamard with the keratotome, was not more fortunate than his namesake of Bordeaux.

If the instruments of which the ancients were so lavish, if every species of brute force has been so carefully rejected from practice in the operations of modern surgeons, with still greater reason ought they to be proscribed on the eye, which is an organ of such delicacy and so easily destroyed. The stroke which is necessarily given to them by letting loose a mechanical spring, the danger of wounding what it is important to avoid, of making an opening either too great or too small, and of cutting sometimes too near and sometimes too far from the sclerotica, are the reasons which have especially intimi-

dated practitioners. It would, however, be unjust to accord no praise to such inventions, and to qualify them as absurd, as some have done, without having it in our power to judge of them with a full knowledge of circumstances. A number of physicians can attest, like M. Hedelhofer, that Petit of Lyons frequently and successfully made trial of the instrument of Dumont. Modified by the nephew of its inventor, it has been said to have obtained sixty-two successful results out of seventy-one operations, if we can receive literally all that has been said of it. What we may affirm is this, that notwithstanding the improvements which have been made upon it by M. Guépin, (*Soc. Méd. de Nantes*, 1834, 2d trim., p. 46,) the instrument of Guérin has been completely proscribed from general practice.

b. *Superior Keratotomy*.—When the lower semicircle of the cornea is opaque or altered in any manner whatever, its section is, in the first place, quite difficult in certain cases. Afterwards the wound is found in unfavorable conditions for cicatrization. This membrane, though sound, may be very small, so that it becomes necessary to detach more than half of it in order to obtain a sufficient opening. In such cases Wenzel advises that we should divide the superior semicircle, and states that he found it to answer perfectly well in the case of the Duke of Belford. Richter is of the same opinion, and B. Bell has formally advised it, even for ordinary cases. According to him there is less danger of the escape of the vitreous body, the cicatrix of the cornea is perfected more rapidly and is less perceptible, and less troublesome to the vision than by the ordinary process. M. Wagner states that M. Alexandre has not hesitated to put the suggestion of Wenzel to a trial, and M. Wilmot, as quoted by M. Eccard, asserts that MM. Lawrence, Green, and Tyrrel have frequently employed it. Dupuytren, in France, also thought proper to make trial of it; but nobody, before the time of M. Jaeger, had gathered a sufficient number of facts upon living man to establish it into a general method. With the upper incision, says M. Jaeger, we have nothing to apprehend from the friction of the palpebral border or of the eyelashes, the tears run more freely and irritate the wound less, which, in its turn, does not so often suppurate, while the prolapsus of the iris must be very rare. A difficulty which first arrested his attention, was the tendency of the eye to turn inwards, or to reverse itself under the upper lid. In this respect he believes that he has removed every objection, by contriving a peculiar keratotome formed of two blades, one of which is a little less than the other, applied face to face in such manner as to represent the knife of Beer or Richter when it is closed. By pressing upon a lateral button the small blade is made to glide upon the large one as in opening a knife with a sheath. The patient and the assistants are to be arranged as in the ordinary method. The operator seizes the double keratotome in the manner of a writing-pen, turns its cutting edge upwards, and passes through the anterior chamber parallel to its transverse axis, while conforming himself in other respects to the precepts laid down above. This being finished he brings back the globe of the eye to its natural position, even depresses it a little if necessary, and fixes it by means of the largest blade of the knife, while the other blade put into operation by the thumb of the same hand, effects the division of the cornea in



gliding from its point to its base. M. Alexandre, (Wagner, *Bull. de Féruss.*, t. X., p. 284.) who, after having passed through the cornea leaves a bridle of it which he afterwards divides with a small blunt-pointed knife, appears to have acquired such practice in the use of this instrument, that he can operate alone and without assistants. Since M. Jaeger, in the space of six months, has forty times extracted cataract successfully by means of his double keratome, it would be incorrect to say that this instrument was positively objectionable. *A priori*, nevertheless, it is difficult to understand its advantages. If it be true that we may firmly fix the eye with its immovable blade, while its other blade is dividing the upper segment of the cornea, it must, on the other hand, pass through the tissues with greater difficulty. Upper keratotomy, moreover, may be very well performed with the ordinary knife. M. Graefe, (*Arch. Gén. de Méd.*, t. XXI., p. 271.) who has used this successfully in seventeen out of eighteen cases, among others upon the Duke of Cumberland, believes it preferable to the double keratome, and I have employed no other instrument in the fifteen cases in which I have had recourse to this kind of keratotomy. As to the operation in itself, of all the advantages that are ascribed to it, there are very few that are substantial. It perhaps exposes less to a wound of the iris, to the escape of the vitreous body, and to the separation of the wound by the border of the eyelids; but the manipulation in all its stages is unquestionably more difficult and less secure than in lower keratotomy. How can we afterwards proceed to laying open the capsule, if the eye keeps itself raised up under the vault of the orbit? What means have we of depressing it, if the will of the patient does not effect it? How direct the pressure, if the crystalline delays in coming out? And the attending circumstances of cataract, can it be supposed that it will be always in our power to reach them? It is, therefore, a method of exception and not of choice, applicable only to the cases pointed out by Wenzel, even supposing then that it would not be preferable to recur to the employment of the needle.

III. *Dressing and subsequent treatment.*—Dressing and the subsequent treatment after extraction differ but very little from what has been recommended after depression, only perhaps that it would not be altogether useless, before covering his eyes, to exhibit to the patient some objects that are not shining, to see if he distinguishes them. It is not in order to gratify mere motives of curiosity that this precaution is recommended, but because we are obliged by such a test, when it is not satisfactory, to ascertain again if some opaque substance which it is important to extract, does not remain in the eye. Repose, avoidance of all movements of the eye and the upper portion of the trunk, now become of more absolute necessity than ever. Though the head should be only slightly elevated, I see no reason, however, which should induce us to place it lower than the feet, as was done by Forlenze. The regimen ought to be more rigid, and continued for a longer time, a longer interval also allowed to elapse before the first dressing, and the eye not so soon exposed to the light as after depression.

*The suppuration of the cornea*, (la fonte de la cornée,) which we have especially to dread, ought to be watched with extreme atten-

tion. We can prevent or arrest it only by means of very energetic treatment; bleeding to the amount of from twelve to sixteen ounces morning and evening, leeches to the temples, purgatives internally, and cutaneous revulsives, simultaneously employed the first, second and third day, are not too severe in such cases. It is important even that we should not hesitate, but recur to it immediately as soon as the linen which covers the eye becomes soiled, and as it were saturated with pus, and that the patient complains at the same time of pains in the orbit, before the fourth or fifth day after the operation.

E. *Comparative examination of the processes.*—I. *Depression*, which was alone in use up to the middle of the last century, fell into such discredit, in France at least, after the publication of the labors of Daviel, that in spite of the efforts of Pott to cause its revival, it was scarcely any longer had recourse to by any one at the commencement of the present century. The modifications which it has received from Scarpa rescued it from this oblivion. But the question, which of the two methods is the best? which has so often been debated, and always remained undecided, is still daily revived. In admitting that it is not incapable of solution, it must nevertheless be conceded that the circumstances which enter into its nature are difficult to be appreciated. How can we conclude, for example, because one process possesses a greater number of distinguished partisans than another? because Scarpa, Hey, Dubois, Dupuytren, Richerand, Béclard, Lusardi and Langenbeck, have procured a greater proportion of cures by depression than by extraction; while for Wenzel, Richter, Beer, Demours, Boyer, Roux, Forlenze and Pamard, the case is precisely the reverse? As soon as an operator has made choice of a method which he is in the habit of employing, his predilection always more or less deceives him, and renders him, in most cases, unfit to judge of other methods. Nor are the results, announced by different men equally well instructed, decisive arguments. The successful issues procured by Dupuytren from depression, in no wise prove that this operator would have been less fortunate, if in the beginning he had exerted himself to give popularity to extraction. In promulgating that by means of extraction Sharp had the same number of successes as reverses; that Richter succeeded in 7 times out of 10, Pelletan and Dupuytren 20 out of 50, M. J. Cloquet 28 out of 80, M. Roux 188 out of 306, and A. Pamard 302 out of 359, we prove nothing more, either for or against this method, than do we demonstrate the pre-eminence or inferiority of depression, by saying that in this manner Beer, Weller and M. Roux have failed in more than half their cases, while Dupuytren cites five cures out of six cases, M. J. Cloquet 97 out of 166, M. Bowen 154 out of 160, and M. Lusardi 4168 out of 5034. M. Robertson, (*Presse Méd.*, t. I., p. 430,) having examined 1307 cases of operation by extraction, taken from twelve different authors, has ascertained that 397 of them were failures, while out of 7529 examples of depression, there were but 104 failures. Out of 64 patients that he himself operated upon by extraction, he cured 32; 14 obtained some relief from the operation, while 18 remained uncured. In 115 cases of depression, on the contrary, he procured 94 cures, with 10 cases of amelioration, against

11 failures. M. Serre, (*Bull. de l'Acad.*, t. I., p. 90.) who adopts depression, states that he has succeeded in 62 instances out of 70.

In the table of Brunner (*Anc. Journ. de Méd.*, t. 84, p. 80, and especially p. 86, 1790,) we find 252 extractions, and out of them 149 favorable, 24 mediocre, 61 unfavorable; out of 169 depressions, 134 favorable, 36 unfavorable; out of 100 extractions, 59 favorable, 17 mediocre, and 24 failures; out of 100 depressions, 79 favorable and 21 failures. M. Fabini, (*Bull. de Fér.*, t. XXVII., p. 71.) who in 107 patients, operated 100 times by extraction, states that he obtained 71 cures. In an aggregate of 179 cases of extraction by M. Roux, (Maunoir, *Thèse citée*, p. 78, 79,) there were at one epoch 97 cures and 89 failures. Suppose, in order to show how deceptive this kind of proof is, that the twenty most skilful surgeons of Europe have operated only by extraction, while 20 others taken at random, have always had recourse to depression. Because the practice of the first shall have furnished a larger proportion of cures than that of the second, does it necessarily follow and by that proof alone, that extraction is preferable to depression?

II. Let us see whether, after having passed in review the principal advantages and inconveniences of both methods, we may not arrive at something more satisfactory.

*Extraction* enables us to remove with certainty and without a return of the disease, the impediment to vision. Besides being attended with but little pain and rarely followed by an internal inflammation, it incurs the risk of wounding neither the ciliary nerves or vessels, leaves intact the whole interior of the eye, the retina, choroid, ciliary circle, &c., but in performing it, we may wound and deform the pupil, and cause the escape of vitreous humor; if the wound which it produces does not cicatrize by first intention, it ulcerates, soon brings about a prolapsus of the iris, and sometimes an atrophy of the globe of the eye, or at least a very extensive opacity of the cornea; the subsequent symptoms also are tedious; it rarely happens that the ophthalmia which accompanies it, terminates before the fifteenth or twentieth day; finally, it cannot be employed in all persons nor at all ages. M. Roux, (Maunoir, *Thèse citée*, p. 81,) who operated upon 43 cases in the spring of 1833, had the misfortune to lose three of them. In 35 patients operated upon in 1836, by the same practitioner, (*France Méd.*, t. I., p. 50,) the escape of the vitreous humor took place in five; the iris was wounded several times; and a violent inflammation of the eye occurred in eleven cases. Thirteen patients recovered their vision perfectly. The result was incomplete in eight others; in fourteen cases the operation did not succeed. One of the patients operated upon, died of erysipelas. In 179 patients operated upon by M. Roux at another epoch, (Maunoir, *Thèse citée*, p. 79, 80,) suppuration of the eye took place in 14 cases, opacity of the cornea in 28, and a false cataract occurred in 22. It would appear, however, according to M. Maunoir, (*Thèse citée*, p. 49,) that at La Charité, during the time of M. Roux, membranous cataract was ascertained to have occurred but in 5 instance out of the above mentioned 179 cases.

*Depression* confines itself to displacing the opaque body, and abandons it in the depth of the organ, leaves there, consequently, a



permanent cause of irritation in the eye, incurs the risk of the reascension of the crystalline, and is frequently followed by secondary membranous cataract, iritis, deep-seated pains and general nervous symptoms. The needle penetrates through delicate tissues, necessarily wounds the choroid, the retina and the vitreous humor, and sometimes also the iris and ciliary body. But on the other hand, it does not give rise to the escape of the vitreous humor, nor does it expose to spots, or ulceration of the transparent cornea, or prolapsus or excision of the iris, nor to the immediate destruction of the eye. On the following day the puncture which it makes is closed, and the conjunctiva, which in a majority of cases is but slightly inflamed, ordinarily resumes its natural appearance at the expiration of from eight to twelve days. Finally, we may if necessary apply it to all cases, and repeat it one or several times upon the same organ, without incurring the risk of any great danger to the patient.

III. After this enumeration it would appear at first view, that depression ought to have the preference over extraction. A rigid examination, however, does not permit us to come to a conclusion so clear and positive. It is true that the puncture of the sclerotica, choroid, retina and vitreous body, rarely produces more pain than the section of the cornea, when we proceed in the manner I have pointed out. The wounding of the nerves, and vessels of the ciliary body, is easy to be avoided, and generally attended with no unpleasant circumstances. When the crystalline capsule is properly lacerated, we cannot see why secondary cataract should be more common after depression than after extraction. If the crystalline is securely fixed in the vitreous humor, it is difficult for it to reascend or for its presence to disturb the retina. With skill also we may succeed in avoiding the iris, which the needle moreover never wounds as seriously as the keratotome. But we should be wrong in maintaining that this method is more simple and more easy than the other. It is not so easy as some persons imagine to pass the instrument between the uvea and the cataract; not to get it entangled between the crystalline and its envelope; to make the proper opening into the capsule; or to hinder the opaque body from being reversed, either upwards or downwards, should the concavity of the needle press it ever so little more in one direction than another, or be deviated from the direction indicated, or that the lens shall have contracted adhesion with the surrounding parts; finally, it is not until after prolonged trials that we are enabled to detach it and fix it at the bottom of the eye. The greatest degree of address, therefore, is indispensable to perform depression in such manner that it may have every possible chance of success. If inexperienced surgeons generally prefer it, it is less owing to its apparent simplicity, than because it does not allow their mistakes to be so clearly noticed as the method by extraction. On the other hand, the irritation which it produces augments the secretion of the humors, and soon creates in the eye a feeling of distension which does not take place in the other method. A chronic or acute iritis, and afterwards a contraction and even a complete obliteration of the pupil, may frequently be produced by it. The lesion of the vitreous humor, without being immediately dangerous, may not however be altogether free from inconveniences.

The crystalline, which in fact disappears sometimes by absorption or dissolution, still more frequently remains with all its usual form and size during the space of years, and even during the whole life, whatever the moderns may have said of it to the contrary, on the authority of Pott, Scarpa, and Dablin, (*Biblioth de Planque*, t. III., p. 341, in 4to.) who, in the year 1722, had ascertained its absorption, and concluded that this always took place after depression. Beer has seen it reascend at the expiration of 26 years. Out of twelve patients whose eyes I have had it in my power to examine after death in the different hospitals, at one year, two years, two years and a half, and four years after the operation, it had scarcely diminished a fifth of its size in the only subject in whom it was perceptibly altered. In the others it had ultimately, by means of some lamellæ of the hyaloid tunic which separated that coat from it, contracted adhesions with points of the retina and choroid, which themselves exhibited a sort of knot or cicatrix of about three lines long. M. Campaignac, who has made special researches upon this point of practice, also asserts that after depression the crystalline lens is far from disappearing as speedily, and especially as constantly as had been supposed. This therefore, it must be allowed, is a serious inconvenience, one which no argument can extenuate, and which will always render the operation for cataract by depression less *complete* than by extraction.

IV. *Keratonyxis*, which Dr. Wedemeyer rejects after having made trial of it in fifty-three instances, would succeed no better, and whatever M. Schindler, who defends it, may say of it, it would be an objectionable mode of giving confidence to practitioners by penetrating after the manner of this author, through the centre of the cornea, instead of passing through the depending point of the anterior chamber. The crystalline, after it has escaped or been abandoned in front of the iris, whether in mass or in fragments, is far from being dissolved there as speedily as some authors assert. Observations collected by M. Pichon at the Salpêtrière, prove that it then often forms there a foreign body, and that if we do not hasten to remove it the eye is exposed to serious dangers. Another defect still more grave is the following: the pupil may remain movable and perfectly uniform, the whole organ have an appearance of the most perfect integrity, but the vision nevertheless be totally destroyed. I have seen four persons at the central bureau, who were blind from this cause, and who had been operated upon at Paris. A man sixty-two years of age, whom I had operated upon in 1829, at the hospital of St. Antoine, came to consult me in 1831. At first view one would say that his sight was perfectly free. The pupil is of a beautiful black, round, regular, movable, nor abnormally contracted or dilated, yet nevertheless the blindness is complete. What has imposed upon the partisans of depression is this, that the patients quite frequently appear to recover their sight after the expiration of a certain time, and preserve it, in fact, during the space of one or two months, but afterwards find that it gradually becomes enfeebled, and that the vision is totally destroyed in less than a year. If the operation, repeated seven times in one case, six times in another, and in a third as often as thirteen times on each eye, enabled Hey to cure his pa-

tients, it is nevertheless true that these repeated attempts prove unsuccessful in a majority of cases. The truth is, however, that their consequences are generally not very serious. After depression, particles more or less opaque almost always remain or are formed in front of the vitreous body. Experience proves that after extraction this accident is infinitely more rare. As to this last method it is evident, that the section of the cornea is much more delicate than the perforation of the sclerotica; that in spite of every precaution the vitreous body may escape, and the iris be extensively divided by the knife, or separated or torn by the crystalline; but after all, if the operation is well performed and the patient in a favorable condition, three accidents, the escape of the vitreous body, the suppuration of the eye, and the consecutive opacity of the cornea, can alone render it dangerous; while all other things being equal, it procures without question a result either immediate or definitive more satisfactory than the method by depression. It is requisite to state, however, that the escape of the crystalline again exposes to two other accidents. Though largely dilated by the action of belladonna, the pupil almost constantly contracts so much as to oppose a certain degree of resistance to the opaque body, which then has a tendency to detach the iris from below, in such manner as to make its escape there if the pressure upon the eye has not been made with an extreme degree of caution. This pressure in its turn, if made quickly upon the cornea in consequence of some unexpected movement of the patient at the moment when the border of the cataract presents itself at the wound, may thrust back the lens above the vitreous body; in such manner that we may remain in doubt whether it is still in the eye, or if it has actually escaped, as has happened to me in one instance.

V. *The prolapsus of the iris*, which often occurs after the operation, and more frequently in old men, in consequence of the cornea in them being tardy in cicatrizing, is treated by mechanical means or belladonna, so long as there is no adhesion; in the contrary case, by nitrate of silver; and is not more difficult of cure here than under any other circumstances. When our object is to leave no obstructing particle in the eye, there is no objection to throwing up through the wound one or two injections of tepid water with a small Anel's syringe. Perhaps even it would be really advantageous to imitate Forlenze and to adopt this method generally. Finally, if the dangers of extraction are more serious and more apparent, those of depression are more numerous and more real. Operators alike skillful will more easily avoid the first than the second, and if the employment of the needle less frequently fails of procuring some relief to the patient, the method of Daviel furnishes by compensation a greater amount of radical cures. Find a way to avoid the suppuration of the cornea, and extraction will obtain a large amount of cures; prevent iritis after depression, and the patients, though free from suffering or danger, will nevertheless run the risk of obtaining but imperfect results from the operation. Out of 300 operations for cataract whose cases I have minuted, I count 200 cures. In the hospitals where I have adopted sometimes extraction above or below, sometimes depression by different methods, I am still uncertain to which method I ought to attribute the greatest amount of advantages or inconveni-



ences. In private practice, extraction evidently succeeds better. I conclude therefore that under circumstances where the two methods might either of them be indifferently made trial of, extraction is preferable; but that in other cases, it is sometimes one and sometimes the other which should be adopted. Depression, for example, appears to be preferable in children and intractable subjects; or when the eyes are small and sunk deep in their sockets, when the cornea has spots upon it and is small and flattened, when the eyelids or conjunctiva have been for a long time diseased, when we have reason to fear an acute inflammation of the connecting tissues of the eye, when the cataract is perfectly liquid, when the pupil is contracted or the iris adherent to the cornea, and when the eye has great prominence and is very irritable. Extraction, on the contrary, presents more advantages in old men and even in adults, if the anterior chamber is large, the crystalline very hard, the cataract membranous or adherent, and the eye perfectly sound, possessing little sensibility, and admitting the keratotomy to penetrate through it without difficulty.

[*Ossified Crystalline Lens*.—The *crystalline lens* having become opaque from a blow in a man aged 44, (see Mr. France in Guy's *Hospital Reports*, Oct., 1845,) was afterwards extracted and found to consist chiefly of *carbonate and phosphate of lime*. T.]

#### [CATARACT.

Dr. Dubois, of Neuchatel, in Switzerland, (*Gaz. Méd. de Paris*, Nov. 8, 1845, t. XIII., p. 721,) removed in July, 1841, by depression, a cataract which was situated in the right eye of a woman aged 49, accompanied with a slight albugo in the cornea, both of which had existed for the space of 40 years. She was induced to undergo the operation from a cataract having commenced to form also on the left eye, in 1841, which when ripe the succeeding year was also removed. This left eye being, from its long use, fully developed, could now see better than the other, where a contrary state of things existed, with the addition of the partial opacity of the cornea, which still presented some obstruction to vision. Doctor Tavignot remarks (*Ib.*, *loc. cit.*, p. 720) that disuse of the eye for a long period undoubtedly arrests its development, and that on this account persons a long time confined in dark places (as in dungeons) lose the sensibility of the retina, and thus become liable to amblyopy, or even to amaurosis. But the condition of the eye, where a cataract complete has existed in both organs for a great number of years, is not precisely, or at least is only partially analogous to that which takes place from the total exclusion of light from *sound* eyes. In old cataracts, the retina still retains its sensibility to a certain extent, and receives a certain portion of the rays of light transmitted through the opaque lens. Hence the important deduction that such cataracts, however ancient, as recent facts have proved, are not beyond the hope of surgical relief. Dr. Tanchou alludes to the remarkable case of a man aged 67, in whom M. Serre, of Montpellier, operated with entire success in 1844, for a cataract which had existed in the left eye for *sixty years*. (*Gaz. Méd. de Paris*, t. XIII., 1845, October 25, No. 43, pp. 677, 678.) The occasion which led to the operation was a traumatic cataract, which suddenly formed in the *right* eye,

accompanied with protrusion of the iris through the cornea. On examining the left eye, he found there a lenticular cataract, with a slight albugo in the cornea. Deeming this the most secure, he hazarded the operation in this eye, when the sight was restored perfectly. Dr. Tavignot furnishes a number of examples of the cure of old cataracts, single or double, congenital or otherwise, and which had existed for various periods from 12 to 20, 26, 30, and even 45 years. Dr. Alexander Watson, of Edinburgh, (*Ed. Med. and Surg. Journ.*, Jan. 1, 1846, p. 57, &c.) considers that the process of breaking up *soft* cataracts, in order to promote their solution and absorption, as now practised and in vogue, is so eminently successful, that it promises to be substituted altogether for depression or extraction in this form of the disease. For hard cataracts, and where depression or displacement is decided upon, he recommends a process somewhat new, and the intention of which is to avoid any injury to the hyaloid membrane and iris, and to prevent the reascending of the lens. As the important point is to disengage the lens from its capsule before depressing it, this is to be effected by lodging it in a breach to be first made with the needle in the vitreous humor, after which the posterior part of the capsule opposite this breach is to be carefully opened by an incision, and the lens also pushed through it into the humor by means of the same needle. Dr. Watson penetrates the coats of the eye at a line and a half posterior to the margin of the cornea, with the small cataract bistoury. This brings him readily upon the part of the vitreous humor designated. After making a suitable breach there, the needle incises the posterior portion of the capsule transversely from the nasal side outwards. The point of the needle is then applied flatwise on the anterior part of the capsule, between it and the iris, so as to make pressure upon the lens upwards and backwards, in order that the lower margin of the lens may pass backwards through the opening in the posterior portion of the capsule; after which, by shifting the point of the needle forwards upon the lens, the latter is pushed backwards and downwards into the breach of the vitreous humor, from whence, he says, *it never rises*. If the capsule remains entire, it is an advantage, as the humors in the different chambers of the eye are thus prevented from incorporating, which lessens the risk of subsequent inflammation, and if it should afterwards become opaque, it can easily be removed by a subsequent operation. Address is required for this operation, as the capsule is usually transparent. This process answers also for reclination. If the lens should unexpectedly be found to be soft, it can be broken to pieces, and these fragments, or some of them, pushed into the breach of the vitreous humor, where they will dissolve. The breaking up of an *opaque lens*, that it may dissolve in the aqueous humor, and performed in such manner as not to wound the hyaloid, is a process well suited to young subjects, whether the cataract be spontaneous or from an injury. For keeping the eyelids open, Dr. Watson finds a plain, broad, flat, smooth ivory hook, the end of which is curved short, so as to be parallel with the shaft, better than metallic instruments. T.]

F. *Artificial Cataracts*.—For a long time it has been thought necessary to produce cataracts artificially, and to exercise ourselves

beforehand upon animals or dead bodies, and to give moreover to the eye all that mobility which renders it so difficult to steady it at the moment of the operation. Troja in Italy, and M. Bretonneau in France, have made trial of some experiments in order to render the crystalline opaque, by means of diluted acids. M. Leroy, (D'Étiolles,) has supposed that this could be effected better by means of electric discharges, but nobody before the time of M. Neuner of Darmstadt, (Maunoir, *Thèse citée*, p. 43,) had made this point a subject of particular attention. The liquid which he made use of with most success, was a solution of six grains of corrosive sublimate in one gros of pure alcohol. A small glass syringe, garnished with platina and terminated by a very fine syphon, and which is traversed by an extremely sharp probe, in such manner as to be enabled to pass beyond its two extremities, is first filled with this solution. It is then passed through an opening previously made at the outer angle of the eye, from above downwards, from without inwards, and from behind forwards, until it reaches the posterior surface of the crystalline, into which the point of the probe, which serves as a conductor to the syphon of the syringe, is plunged, after having perforated its capsule. The small probe being then no longer necessary, is withdrawn, and the thumb, resting upon the extremity of the piston, gently forces the liquid into the substance of the lenticular body, which soon changes its color. The same process is performed, if necessary, on the inner angle of the eye, when the operation is terminated. Among the contrivances devised for representing upon the eyes of the dead subject, the principal difficulties which are encountered upon living man, the opthalmo-phantome of M. Sachs, is certainly the most ingenious; composed of a socle mask, and eye-supporter (*porte-œil*), the description of which I cannot give in this place, it appears to me, however, to be too complicated ever to be received into general use. I have no necessity in saying, that one of the middle refractors of the eye being now removed or displaced, almost every individual who has been operated upon for cataract, ought to wear spectacles with convex glasses, like long-sighted persons. Upon this subject, moreover, Maitrejan had established upon the dead body, what M. Roux and others have since announced—to wit, that after the extraction of the crystalline, the vitreous body becomes more convex in front, as if for the purpose of filling up the void, which after the operation has been left in the eye, and to render spectacles less necessary. In children, and in persons blind from birth, in all those in fine who for the first time are obliged to subject their sight to a course of discipline, it is well to add to the precautions which are generally used, a very simple means successfully employed by Dupuytren, and which consists in fixing the hands behind the back, in order that being deprived of the use of these members, they may be compelled to make greater efforts with their eyes to direct them upon external objects.

#### § IV.—*Artificial Pupil.*

Two very distinct conditions of things may require the formation of an artificial pupil; the opacity of the cornea, and the contractions or obliteration of the natural pupil. In the first case, whether .



the impediment to vision be the result of a simple ophthalmia, an ulcer, or a wound, or any other lesion of the cornea, is a matter of little importance. Provided the interior of the eye is not affected, and that a transparent point remains outside, the operation for artificial pupil may be undertaken. In the second case, whether there be myosis or ptisis, synechisis or atresia; whether the pupil is completely closed or merely contracted; whether the alteration be congenital or accidental, the effect of an internal ophthalmia, of an iritis, or of the operation for cataract, by depression, or extraction; whether the iris preserves its form or not, adheres, or is not adherent to the cornea or the capsule of the crystalline; or whether there may or may not be sinechia, whether anterior or posterior, the operation is equally practicable, (though it offers infinitely less chances of success,) so long as the retina has not lost the faculty of perceiving the rays of light, and that the anterior chamber retains its transparency. If this last condition is wanting, it will be in vain that we make a new pupil, and that the light arrives at the bottom of the eye. Acute or chronic inflammations of the internal tunics, the progress of which has not been definitively arrested, also constitute counter-indications, which, though less absolute, are nevertheless sufficient with a few exceptions to restrain a prudent surgeon. Almost all authors prohibit, moreover, the making of an artificial pupil, so long as there is but one eye only diseased, and that the patient sees sufficiently well to get along without a guide. The operation, in fact, being sometimes followed by accidents, which may in themselves produce serious injury to the vision, it would not appear to be prudent to expose the patient to lose the little that remains to him, when, moreover, in the attempt to ameliorate his condition, the chances of success are sufficiently precarious.

A. *Operative methods*.—All the processes recommended for forming a new pupil may be resolved into three methods. In one, *iridiotomy* or *coretomy*, we incise the iris only; in the second, *iridectomy* or *corectomy*, we excise a flap from this membrane; while in the third, *iridodialysis* or *coredialysis*, we confine ourselves to detaching its circumference at one of its points.

1. *Coretomy* or *method by incision*.—Before the time of Cheselden, no one spoke of iridiotomy; since then it has attracted the attention of Mauchart, Sharp, Sprægel, Meiners and Rathleaw, who have proposed it in cases of persistence of the pupillary membrane; and of Odhélius, Guérin, Janin, Wenzel, and MM. Maunoir, Adams, &c., who have subjected it to various modifications. The patient, operator, and assistants, are to be placed in the same manner as in the operation for cataract.

a. *Process of Cheselden*.—By means of a small knife of the shape of a scalpel, with one cutting edge only, Cheselden penetrated in the same manner as is done for depression through the sclerotica as far as the uvea. Having arrived there, he caused the point of his instrument to pass into the anterior chamber. Afterwards directing it from without inwards, and from before backwards, according to some, or on the contrary, according to others, from the internal to the external angle, and from behind forwards, he made at the centre of the iris a transverse incision of from two to three lines in length. A

pupil of an elliptical form, similar to that of certain quadrupeds, was the result of this delicate operation, which was attended with entire success, and vividly attracted the attention of the learned world.

*b. Process of Sharp.*—Sharp in performing coretomy, professes nothing else than to have imitated Cheselden. A small scalpel, slightly convex on its back, a figure of which he gives, is first directed horizontally, its cutting edge turned backwards, into the posterior chamber, between the circle and root of the ciliary processes. Nothing then remains but to incline its point forward, and to push it a little in order to penetrate into the anterior chamber. We have now to incise the iris transversely, either upon a line with or below, or what is better, above the natural pupil. The opening made by this operation, which continued for some time, was not long in contracting, and ultimately closed up completely. Sharp thus appears to accord very little confidence to the method of Cheselden.

*c. Mauchart* has no other claim to be mentioned in this place, except because he appears to have been the first to have advanced the idea of perforating through the cornea in order to form the pupil. He moreover cautions us against giving too great an extent to the artificial opening, and remarks that this kind of pupil is not capable either of spontaneous dilatation or contraction like the natural one. *Henkel* also recommends that we should go through the anterior chamber. *Heuermann*, who is of the same opinion, recommends for the incision of the iris and cornea, that we should use the ordinary lancet in place of the needles or knife of Cheselden.

*d. Process of Odhélius.*—Odhélius, in a patient with an opaque cornea, after having incised the cornea in the same way as for extraction in cataract, divided the iris from its centre to the circumference, on a line with the pupil, which in other respects was very much contracted. By this means he obtained a triangular opening continuous in its base with the remains of the primitive pupil, and which enabled the vision to be completely reëstablished.

*e. Process of Janin.*—Janin, having frequently made trial of the method of Cheselden without success, supposed that we would succeed better by giving a vertical direction to the wound. The transverse incision, he remarks, closes speedily and almost of necessity, because the radiating fibres of the membrane are separated only; while they are actually *divided* by means of the perpendicular incision, made a little within the natural pupil. It was an accident which led him to make this modification. It happened to him as it would to any person, that he divided the iris in performing the operation for cataract by extraction, and that he thus made, against his will, an artificial pupil on the side of the natural one. Perceiving that this opening, which he did not intend to make, did not close up, while those which he had effected designedly always became obliterated, he proposed to take advantage of this, and directed his attention afterwards to systematizing the process which chance had pointed out to him. Körtum proposes that in place of the scissors, we should incise the iris vertically with the keratotome. But, notwithstanding the experience of Weisseborn, and the observations of Pellier, which are calculated to corroborate its advantages, the process of Janin was soon abandoned. It was soon evident that the

pupil made in this manner, does not endure any longer than, and closes and disappears fully as much as it does by the transverse method.

*f. Process of Guérin.*—With the view of uniting their advantages, Guérin proposed to combine the processes of Cheselden and Janin, and to employ them together, that is to say, to make a crucial incision in place of a simple vertical or transverse slit. But while on the one hand the operation is thus rendered much more difficult, on the other, it is not uncommon to see the four flaps approximate so much at their apex as to prevent the light from arriving at the bottom of the eye; so that this recommendation has been rarely adopted in practice.

*g.* When the vision is impeded by a leucoma, Pellier confines himself to enlarging the natural pupil, in place of making one complete in itself. For that purpose he incises the cornea in the same way as for extracting the crystalline; introduces a small canulated sound into the posterior chamber of the eye; uses this as a guide to the point of a small pair of scissors, and first divides the iris outwardly, then inwardly and upwards, from the pupil to the ciliary ligament.

*h. Process of Maunoir.*—The process by M. Maunoir, though the result of researches made by this author, nevertheless appears to be only an improvement of that of Pellier. This surgeon, by means of a keratome or lancet, makes an opening of two or three lines in extent at the outer and lower part of the cornea; introducing through this a small pair of scissors bent at an angle on the border near their heel, and one of the blades of which terminates in a button, he opens them in the anterior chamber; then plunges one branch through the iris into the posterior chamber, in such manner that the other which bears the button remains behind the cornea; incises the membrane thus included inwards, then outwards and upwards, and forms at its expense a triangular flap whose adherent base faces the circumference of the eye. The *needle-shaped scissors*, devised by M. Montain, with the view of avoiding the previous section of the cornea, though ingenious, do not however present an improvement of sufficient importance ever to obtain the preference claimed for them by their inventor. By this double incision the circular fibres that M. Maunoir supposes to exist in the iris are divided twice, while the radiating fibres remain intact; from whence it happens that these latter by their contraction constantly tend to dilate the new pupil, in place of favoring its contraction, as in the method of Cheselden.

*i.* The ideas of the surgeon of Geneva, which he has frequently, and again in 1837 (*Bibl. Universelle de Genève*, Avril, 1838) practised upon with success, have received the sanction of the celebrated *Scarpa*, who, in order to sustain them, was eager to renounce his own method. They have also met with partisans in Germany. But in England and France they have not generally been made trial of. Moreover, it is evident that if we were desirous of performing coretomy upon this principle, of which M. Carron avows himself the champion, it could be advantageously modified by making use, as I have often done, of the ordinary keratome, or the movable cutting needle, which I contrived for form-



ing the triangular flap of the iris, thus doing designedly what we often do in spite of ourselves when we perform the operation for cataract by extraction; this is the process which Daviel, Hoin and Wenzel appear to have recommended for adoption, and which Odhélius has also sanctioned.

*j. Process of M. Adams.*—M. W. Adams has gone back to the process of Cheselden, with this difference, that in place of a straight knife like that of Sharp, he employs a small scalpel convex upon its cutting edge, breaks up the crystalline when he considers it opaque, and endeavors, what is sufficiently singular, before quitting the eye, to entangle some fragments of it in the transverse incision of the iris to prevent its closing up. M. Roux frequently made use of this process while I served him as assistant, and in every case the new pupil ultimately disappeared. Nor does it appear, moreover, to have received much respect in the country of its author, for it is rare that it has been had recourse to there by other surgeons. Nor have I myself been more fortunate with it in the two trials that I have made of it.

*k. Coretomy*, still further modified by Jurin, MM. Langenbeck, Weller, Faure, and by *Wardrop*, who by means of a needle passed into the posterior chamber, perforated the iris a first time from behind forwards in order to enter into the anterior chamber; then a second time from before backwards, and nearer to the inner angle of the eye in order to return into the posterior chamber; and who afterwards united together by means of one of the cutting edges, rather than by the point of his instrument, the two small wounds, by detaching one of the extremities of the flaps which they circumscribed, and all this with entire success, in a lady 46 years of age, blind from her birth, has found in these latter years numerous antagonists among the oculists of Germany.

*l. Process of the Author.*—I make use of a knife somewhat longer and of less breadth than that of Wenzel, cutting on its two edges to the extent of four lines from its point, and afterwards blunt or rounded upon the back as far as the handle, an instrument in fact of which the *serpent-tongued* lancet may convey a tolerable idea. Held as a writing pen, it is plunged through the cornea on its temporal side, and a little obliquely from before backwards. When it has arrived in the anterior chamber, its point is guided with precaution into the posterior chamber, dividing the iris as it proceeds, and then brought back after making a track of two or three lines, into the anterior chamber through the same membrane. In continuing to advance it forward, up to the point of piercing the cornea a second time, it becomes easy to divide the species of bridge which covers its anterior surface, and not to detach completely one of the extremities of this flap of the iris, until after having transformed the other into a pedicle as narrow as may be desired. We thus procure a division which amounts to a loss of substance. The fragment of membrane which has been cut out cannot be long in rolling up upon itself, and must ultimately become dissolved in the aqueous humor. It is even possible in most cases to excise it entire, when the manipulation which I have just pointed out has been properly executed. In fact if the instrument acts in an equal manner on the two ad-

herent points of the bandelette to be divided, up to the moment when the section of one is completed, all that will be required to detach the other and to transform coretomy into corectomy, will be to advance the keratotomy a little farther, and to incline its cutting edge correspondingly towards the cornea. My *keratonyx* attains this object still better.

II. *Coredialysis or Method by Décollement*.—To Scarpa we are indebted for having systematized *décollement* into a method; many authors, however, had mentioned it before him. Sharp for example, in speaking of coretomy, makes the remark that the iris very frequently detaches itself when pressed upon by the instrument in place of being divided. In a patient operated upon for cataract by Wenzel, the crystalline escaped in this manner through an accidental opening. The natural pupil afterwards almost entirely disappeared, but the patient continued to see by the abnormal opening. If we may believe Assalini, Buzzi de Milan, who performed coredialysis in 1788, plunged a spear-shaped needle through the posterior chamber into the body of the iris, at a line distant from the obliterated pupil, and by well directed tractions detached this membrane from the ciliary circle. A. Schmidt, who on his part published a good memoir on this subject in 1803, states that he had recourse to this operation in 1802, and had conceived the first idea of it in 1792.

a. *Process of Scarpa*.—Scarpa, when his needle has reached into the interior of the eye, as in the operation for cataract by depression, turns its concavity forwards; directs it behind the upper and inner portion of the uvea; pushes its point through the iris into the anterior chamber; and uses it afterwards as a hook in oscillating it from above downwards, from behind forwards, and from within outwards, in order to detach the great circumference of this membrane to the extent of three or four lines, in such manner in fact as to procure an opening a slight degree larger than the natural pupil.

b. *Process of T. Couléon*.—Toché-Couléon, one of the first, Flajani, Himly, Beer especially, and Buchorn, proposed that the needle, whether straight or curved, should be directed in some way or another through the cornea, and not through the sclerotica. According to them, it becomes full as easy in this manner to place the new pupil upon the out as upon the inside; moreover, we see better what we are doing, and the puncture of the eye must be less dangerous.

c. *Process of Assalini*.—Assalini, after having made an incision at the outer angle of the cornea, introduces into the anterior chamber a pair of fine curved forceps, soon after opens them, seizes the iris at a short distance from its ciliary border, and detaches it as in the process of Scarpa. These forceps are considered useless by Bonzel, who substitutes for them a very small hook, which is conducted in the same manner. Dzondi makes use of a description of forceps, the inner side of one of whose branches is to be grooved in order to receive the other when the instrument is closed. He pretends that with this forceps we run no risk of lacerating the iris, and that by it it is more easy to effect *décollement* than with any other instrument. The strongest and best founded objection to be made against coredialysis is, that the detached border of the iris gradually reassumes its natural posi-

tion, and that, at the expiration of a certain time, the new pupil almost always closes.

*d. Process of M. Langenbeck.*—To obviate this inconvenience, M. Langenbeck, after having seized hold of the iris by means of a small hook protected in a sheath, draws it forwards and insinuates it into the wound of the cornea, which should be very small, and then attaches it there as if for the purpose of producing a *myocephalon*. The adhesions which this species of hernia soon contract prevent the pupil which has been formed from narrowing, and give to the operation all the certainty desirable.

*e. Reisenger*, who advances the same idea, censures the sheath-hook of Langenbeck, and makes use of a simple eye-forceps, the point of which is curved like an erigne on one of its sides. This forceps is introduced flatwise, and shut to the farthest limits of the anterior chamber. Its concavity is then turned backwards. It is opened the space of one or two lines, to be closed again after having plunged it through the iris, which membrane is thus found pinched or hooked up, and is then detached and drawn to the outside in order to produce an artificial prolapsus through the cornea. The *coreoncion*, so much extolled by M. Graefe, is used in the same manner as the sheath-hook of M. Langenbeck, and differs from it scarcely except in the little keratotomy which it has on one of its extremities.

*f. Process of M. Lusardi.*—M. Lusardi has proposed to reduce corœdialysis to its greatest degree of simplicity, by devising a hook-shaped needle which alone would answer for the whole operation. When closed, this instrument has the form of a Scarpa needle, or rather of a very small serpette. The two stems which compose it are arranged in such manner that, by drawing a little upon the shortest or that which corresponds to its convexity, there immediately results from it a notch which transforms it into an actual forceps. It is introduced through the cornea in the same way as in keratopyxis, in order to pass it through the anterior chamber, if that is free, or in the opposite case through the posterior chamber, after having cut through the iris up to the ciliary circle. Having arrived there, the surgeon presses its back against the great border of the ocular diaphragm, which he endeavors to detach by means of an oscillatory movement, then opens his needle, and afterwards loosens its spring, by which means the membrane is thus found embraced. Nothing remains but to bring it to the opening of the cornea, with the precautions required for giving to the new pupil the necessary dimensions.

*g.* With this instrument, already described in Italy by Donegana and Baratta about twenty years since, M. Lusardi thinks we run no risk of wounding the capsule of the crystalline, which is not demonstrated, and that we may be enabled to establish an artificial pupil upon any point whatever of the ciliary circumference, which is more correct; but the ordinary needle presents nearly the same advantages. I do not speak here of the process of Assalini, which, in order to remove the new pupil as far as possible from the crystalline, proposes that in corœdialysis we should destroy a portion of the ciliary circle and processes, at the same time that we detach the great circle of the iris.



This method clashes so much with the object which the practitioner has in view, that no surgeon has ever yet had recourse to it.

*h. The process of Donegana* is not obnoxious to the same objection. Perceiving that the pupil, after coredialysis by the method of Scarpa, almost always finished by closing up, this oculist has proposed, in order to prevent such an inconvenience, that we should unite the method by incision to the method by décollement. He therefore, after having detached the iris from the sclerotica, divides it to the extent of one to two lines, in a direction parallel to its radiating fibres, and from its greater to its smaller circumference. For that purpose we may penetrate through the posterior or anterior chamber, and make use of the ordinary needle, or of an instrument with a blade which is somewhat more slender, almost straight, and very keen. Unfortunately it is not so easy as might be imagined to incise the iris after having detached it in the interior of the eye. Unless we make use of the keratonyx, it folds itself up under the knife, and tears or separates itself from the surrounding parts, much sooner than it is divided. Nevertheless it is an improvement which may have some advantages, and which it would be advisable to make trial of when we perform coredialysis according to the method of Scarpa.

III. *Corectomy, or the method by Excision.*—*a. Wenzel* appears to be the inventor of corectomy. Nevertheless it cannot be denied that before him it was put in practice by Guérin, who, as Sprengel remarks, sometimes excised the point of the flaps of his crucial incision. *Sabatier*, who adopts the process of Wenzel, gives the most satisfactory account of it. We proceed in the same manner at first as for the extraction of a cataract. The keratotome, while passing through the eye, ought to cut out, at the expense of the iris, a flap similar to that of the cornea. A pair of small scissors are then introduced into the anterior chamber, and serve to excise this flap near its base, while the point of it moreover, if necessary, is seized with a pair of eye forceps. By this means we obtain an opening with loss of substance, which cannot be closed up, and which presents every possible chance for success.

*b. Demours*, however, adopted a mode somewhat different in a case of leucomatous cornea. He made an incision into the anterior chamber, which comprised at the same time both the cornea and the iris; then with two cuts of the scissors, he circumscribed and removed a flap of this membrane of the size of a sorrel seed. The difference between these two modes is in reality very trifling. The first has some advantages, in the fact that it enables us to confine ourselves to corectomy, if we should prefer this after having commenced, but the second evidently exposes us to less risk of emptying the eye. It is from one of these processes, moreover, that are derived the principal methods extolled by the oculists of our time.

*c. Process of T. Coulton and of M. Gibson.*—*M. Gibson*, like Wenzel, first opens the cornea to as great an extent as for extracting a cataract, but without touching the iris. He then causes this membrane to protrude through the wound by means of a slight pressure made upon the globe of the eye; then by means of scissors, properly hollowed and curved on their flat side, he excises a disc

from it of suitable size. Forlenze has no fear of incising the cornea to the extent of two-thirds of its circumference, in order to seize the iris with the forceps or hook, and to remove a flap from it in the manner of Demours. In a thesis supported in 1803, M. Mirault gives the credit of a similar process to Couléon.

d. *Beer* asserts that all that is required is to make an opening of two lines in the anterior chamber to make the iris protrude of itself into this small wound, when the part which tends to escape outside may be immediately excised. Otherwise he seizes this membrane with an erigne, and effects its exsection as in the preceding cases.

e. *Process of M. Walther*.—M. Walther, with a view no doubt of reconciling the principles of Gibson with those of Beer, incises the cornea to the extent of about three lines; draws the iris to the outside by means of a hook, and by means of a small pair of scissors excises a flap from it of the proper dimensions. By means of a wound of nearly the same dimensions, M. Lallemand has found that he could seize the membrane with a small pair of hook forceps, draw it towards him, excise from it a flap of considerable size, and form in this manner an elliptical pupil like that of cats, vertical in its position, and two lines in breadth and six in length. The success in one case, says the author, was so complete, that the patient was enabled to follow the army of Spain in the capacity of a nurse.

f. The needle forceps of Wagner, and of Dzondi; the *raphian-kistron* of Emden; the *iriankistron* of Schlagintweit; the *plomise* of Menser, and the process of Himly, do not differ sufficiently from some of the instruments and processes described above to make it necessary for me to detain the reader with an account of them.

g. I will make the same remark of the method of *Autenrieth*, which consists in destroying a portion of the sclerotica and of the ciliary circle and processes, and removing a disc, in a word, of the globe of the eye outside the cornea, with the simple precaution to close up the opening which has resulted with a flap of the conjunctiva, which should have previously been separated from it. The best that can be done in reference to such a suggestion, is to say nothing of it, and I am astonished that Beer, Himly, Müller, Guthrie, Ammon and Ulman, (*Nimmo, Arch. Gén. de Méd.*, 2d ser., t. III., p. 237,) should have gone to the trouble of making a trial of it.

h. *Process of Physick*.—Physick, after having incised the cornea and iris, in conformity to the precepts of Wenzel, introduces into the anterior chamber a forceps terminated by plates, in some respects similar to those of our chimney tongs. The inner surface of these plates presents upon its circumference a cutting edge, which forms a scissors of peculiar description, and by means of which it becomes easy to seize hold of and remove the flap of the iris which has previously been cut out by the keratome.

B. *Relative value of the different Methods*.—I. These numerous processes show at least the constantly reiterated efforts of practitioners, to improve one of the most delicate operations of ocular surgery. Unfortunately there are often to be encountered here obstacles and difficulties, which the greatest address and most consummate skill are incapable of surmounting. When rigidly examined there can be no doubt that corectomy is preferable to the other two methods.

Nevertheless since, in order to perform it, it is necessary that the instrument should traverse the anterior chamber, it is next to impossible to have recourse to it, when the iris adheres to the cornea, or when this last membrane is opaque throughout a great portion of its extent. Coretomy presents nearly the same inconveniences without having the same advantages, since, as experience has demonstrated, the opening which it makes rarely endures beyond a few weeks. It is to coredialysis, therefore, that we should then give the preference. The same would be the case in instances of *adherent membranous cataract*, in those of any description of *opacity* whatever, situated in front or *behind the iris*, and which could not be destroyed, inasmuch as we are here obliged to bring the pupil to the circumference of the ocular diaphragm.

II. Coretomy and coredialysis alone enable us to operate by *sclerotomy*. Nevertheless, as they may also be performed by *keratotomy*, we ought not, as a general rule, to prefer the first, except in strongly marked cases of anterior synechia, (*sinéchie*,) inasmuch as we almost unavoidably wound the crystalline. Should we be disposed to restrict ourselves to coretomy, but not to employ the process which I have proposed, that of M. Maunoir, or better still that of Wenzel, would appear to me to merit the preference. To perform coretomy, we may adopt, so to speak, indifferently, the process of Demours, Forlenze, Gibson, Beer, or M. Walther, though the best of all, in my opinion, would be that of Physick, such as I have modified it, or the *iridectum* of M. Onsenort, if it were possible to procure a sufficiently small punch, and one that was perfectly constructed; which, up to the present time, I have not been enabled to obtain.

III. When we decide in favor of coredialysis, the simple hook of Bonzel is quite as good as the more complicated instruments of Langenbeck, Beer, Reisinger, &c.; but I doubt if it be as easy as these authors seem to imagine, to attach in the opening of the cornea, the portion of the iris which has been brought there with more or less difficulty. Should the accident for which we desire to establish an artificial pupil have taken place as the consequence of an operation for cataract, there would be much less inconvenience here than in the other cases, in directing the instrument through the posterior chamber. In such cases, also, the bottom of the eye is too much altered to leave room to hope for much success. Nor can we perceive that it would be necessary to open into the anterior chamber as largely as has been recommended by Wenzel, Forlenze, and Gibson. It would be otherwise should the crystalline or its capsule have preserved their natural relations.

However little we may suspect opacity in these parts, they should be extracted or depressed. Perhaps, also, their extraction or their displacement should be laid down as a law, whether opacity has commenced or not. We should thus avoid the unpleasant consequences of the occurrence of a consecutive cataract, destroying the prospect of success for the first operation, as happened to me in the case of a man aged thirty years. In this respect, the opening of the cornea cannot be too large, since we not only establish an artificial pupil, but perform at the same time an operation for cataract



IV. When there are *spots in front of the eye*, and that we cannot operate by keratonyxis, the case necessarily becomes embarrassing. If the incision is made on a sound part of the cornea, the cicatrix which must result from it, and the inflammation which may supervene, very frequently destroy the transparency of the small portion which the primitive disease had respected. Upon the leucomatous portion on the contrary, it is to be apprehended that the wound may be transformed into an ulcer, and suppurate and cause the destruction of the eye. Nevertheless many practitioners, MM. Faure and Lusardi among others, have asserted that the section of a cornea thus affected, is not as formidable as is generally thought, and go so far as to say that it agglutinates more rapidly than that of a tunic which is not diseased. This also may readily be conceived. Such tissues being less sensitive, less excitable and more approximate in their character to vegetative life, must be more moderate in their inflammation, than if they were in their normal state. If then, the cornea is opaque to a great extent, we must cautiously respect the part that remains, and penetrate through its altered portion. In the opposite case, when its transparency is not affected but by a spot which is accurately circumscribed, and of little extent, it is preferable to incise in the natural tissues.

V. Moreover, in order to be prepared to meet all the necessities and exigencies of the disease, it is well to familiarize ourselves with the greater part of the processes which I have deemed it advisable to point out, since there are cases in which each of them may become particularly applicable. I would however remark, that the method by excision is in fact the only one which presents real chances of success. All the methods by incision, whether simple or complex, are decidedly bad, and ought not any more than décollement to be adopted, unless as an exceptionable resource. I have performed the operation for artificial pupil according to the precepts of Scarpa, Wenzel, and M. Maunoir, and I have noticed that the opening in the iris, after having remained sufficiently large during a certain space of time, has almost constantly become ultimately reduced to a trifling affair. I performed it in a young girl by the process of Odhélius, and although the slit at first appeared very large, it finally became contracted to a considerable degree.

VI. These facts, and the wounds of the same membrane, during the operation for cataract, have moreover satisfied me that the different processes suggested by the alleged muscular nature of the diaphragm of the eye repose on a false basis. In place of retracting itself towards its root, the flap which I made in the iris in 1829, at St. Antoine, in a man sixty years of age, gradually approximated on the contrary, by its free border, to the point from which I had separated it. The same thing occurred to me in 1831 at La Pitié; and I have lately had a similar instance following the extraction of a cataract. Here is another example which appears to me entirely conclusive. A peasant 45 years of age, was operated upon by me at La Pitié, in the month of June, 1831. On one side the iris slipped under the edge of the knife, and I removed a flap from it which left a notch, one line deep and two in breadth, and a little nearer the ciliary circle than the pupil upon the border of which it was made. But in place of be-

ing transformed into a large oval opening, and becoming deformed, the circle of the pupil absolutely lost nothing of its regularity.

It continued to dilate and contract as before, to such degree that its two extremities appeared to be drawn towards each other, as if to establish its continuity, rather than having a tendency to retract outwards, or to be withdrawn towards the great circumference of the membrane, and to become confounded with the bottom of the notch. M. Graefe (*Arch. Gén. de Méd.*, t. XXI., p. 271,) states that he has five times performed the operation for artificial pupil with success, and M. Eckstrumer (*Bull. de Fér.*, t. VIII., p. 203) appears to have been not less fortunate in three of his patients; I have succeeded with it but twice. M. Laugier, (*Bull. de Therap.*, t. VIII., p. 380,) by introducing a needle through the cornea, has succeeded in destroying the adhesions which kept the pupil contracted. I was no less fortunate in 1835, in a patient of M. Requin. This method, which was so much extolled at first by M. Silvy, (*Mém. de l'Acad. de Méd.*, t. IV., p. 445,) for cases of obstruction and contraction of the pupil from the debris of a cataract, would be better adapted for the obstructions caused by inflammations of any kind, as pointed out by M. Siméon, (*Revue Méd.*, 1828, t. III., p. 126,) and wherever opaque flaps or adhesions should mask the pupil, or keep it immovable. I will add, that in such cases scleroticonyx, by enabling us to depress false cataracts with greater facility, would be preferable to keratonyxis.

C. *Consequences of the operation.*—After the operation the patient is to be submitted to the same regimen, and treated with the same precautions as if he had been operated upon for cataract. Nevertheless, the accidents that follow are rarely as severe. Should we confine ourselves to keratonyxis, or even to scleroticonyx, they are often reduced to inflammatory symptoms of the most unimportant character. If the eye has not completely, or for a great length of time, lost the function of perceiving the light, very frequently the patient, under such circumstances, may dispense with keeping his bed, and wear only a black silk bandeau during the space of a few days. The lady operated upon by Wardrop was enabled to re-enter her carriage immediately after, and without any inconvenience. An intractable patient, whom I could not restrict to any systematic course, got up on the evening of the same day of the operation, and on the following day was indisposed to make any retrenchment in his diet or occupations, yet not the slightest inflammation supervened. Out of seven other individuals whom I have operated upon, none of them experienced any inflammatory symptoms. When, however, we perform keratotomy and largely open into the cornea, like Wenzel, &c., and when we have deemed it necessary to extract or displace the crystalline or its connections, and when the natural pupil has been completely closed for a long time, it would be imprudent not to proceed in the same manner precisely as after the operation for cataract. In all these cases, as that of M. Lallemand, (*Arch. Gén. de Méd.*, t. IV., p. 69,) for example, demonstrates, the most intense ophthalmia may be readily developed. Out of an aggregate of 18 operations for artificial pupil, I have obtained only three successful results, but none of the patients were attacked with

any severe accidents. Moreover, we ought not to be apprehensive of giving too great an extent at first to the opening into the iris, for besides that the new pupil for a long time retains a great tendency to contract, we have now the proof that the absence of the iris does not abolish vision. M. Hentzchel (*Lancette*, t. V., p. 440,) relates the history of three sisters, in whose eyes this membrane was wanting, but who could, nevertheless, see very well. The same was the case in the child six years of age mentioned by M Stoeber, (*Journ. de l'Institut.*, 5th year, p. 394,) and with the persons whom I have elsewhere mentioned, (*Dict. de Méd.*, Art. *iris*, 2e edit.) I have already seen in eight or ten instances, one, or even three accidental pupils in the neighborhood of the natural one, without its being productive of the double vision mentioned by Righellini, (Portal, *Hist. de la Nat.*, &c., t. V., p. 480.) If we have to operate to remedy the consequences of an internal ophthalmia, we must be prepared to meet with a sort of true or false cataract behind the iris, and adopt measures to remedy this difficulty or destroy its effects.

#### § V.—*Puncture and Incision of the eye.*

Formerly puncture of the eye was made use of in *onyx*, or effusion of pus between the lamellæ of the cornea, in *hypopyon* or abscess in the anterior chamber, in *empiesis*, or abscess in the posterior chamber, in *hydrophthalmia*, and *buphthalmia*, and in all cases, in fine, where the eye was the seat of too great an accumulation, either of its natural humors or of any abnormal fluid whatever.

A. *Onyx*.—When the small purulent collections, which are met with sometimes in the substance of the cornea, have obstinately resisted antiphlogistic, emollient and discutient remedies, &c., nothing appears more rational than to open them. The operation, moreover, is so simple that it is scarcely necessary to describe it. The surgeon depresses the lower lid; causes the other to be raised up by an assistant; seizes with the right hand for the left eye, and with the left hand for the right eye, a common lancet, divides the layers of the cornea, which separate the *onyx* from the exterior, and repeats this puncture as many times as there are distinct abscesses in front of the eye. A cataract needle would be full as good as a lancet, and it is readily understood that we might if necessary make use, with the same advantage, of any sharp-edged pointed instrument whatever. Unless the transparency of the cornea should be irredeemably lost, the instrument ought to be directed as far from the centre of the organ as the disease will possibly permit. In the cases under consideration, surgeons of the present day do not approve either of puncture or incision. It aggravates, they say, or reproduces the inflammation, leaves among its consequences ineffaceable cicatrices, and may hasten, or even produce the suppuration of the eye. Moreover, the matter which forms the *onyx*, being almost always adherent to the lamellæ of the cornea, is rarely sufficiently fluid to enable a simple incision to allow of its escape. Finally this pus, which never constitutes any other than quite thin layers, spontaneously disappears as soon as the ophthalmia which produced it has subsided or is subdued. While adopting a portion of these reason-



ings, which already have been contested by Woolhouse, Mauchart, &c., I nevertheless consider the operation useful, when, as an exception, the pus constitutes a legitimate abscess. The facts that science possesses, and the last memoir of M. Gierl in particular, appear to me to demonstrate that puncture of the eye under such circumstances, presents unquestionable advantages, and that the moderns have exaggerated its dangers.

**B. *Hydrophthalia*.**—Hydrophthalia, whether accompanied or not by liquefaction of the vitreous body, whether there be or be not blood or pus effused into the humors, possesses in puncture of the eye a last resource, which at the present day, perhaps, has not been had recourse to sufficiently often. It would be doubtless imprudent to commence the treatment with this; but when the proper general or topical medications have proved unsuccessful, and that the difficulties which continue are manifestly owing to an unnatural distension of the globe of the eye, I see nothing more rational than the paracentesis of this organ. By putting a period to the compression of the retina, the iris, and of the ciliary circle, processes, vessels, and nerves, it moderates the most violent pains, and appears to me capable of preventing the most serious disturbances, and to constitute a means, if not curative, at least palliative, and one of the most valuable auxiliary remedies.

**I. Paracentesis of the eye,** which has been practised in Japan and China for centuries, and performed by Tuberville and Woolhouse, can scarcely be said to have been formally proposed for hydrophthalia before the time of Valentini, (*Coll. Acad.*, partie étrang., t. VII., p. 434,) Nuck, (*Journ. de Simmons*, t. I., p. 282,) and Mauchart. In the beginning it was performed by a small trochar, which Woolhouse recommends should be plunged through the sclerotica, while Nuck directed it upon the centre of the cornea itself. At present, puncture, properly so called, has been generally abandoned. Incision in almost every case is advantageously substituted for it, except that some recommend opening into the anterior chamber, while others, as M. Basedou for example, advise the posterior chamber. Bidloo made use of a bird-beaked lancet, directed upon the lower part of the cornea. Meckren used a large triangular needle expressly made for this purpose. At the present day we more especially employ the cataract keratome. Saint-Yves made a transverse incision in the transparent cornea. Louis proscribes too large an opening, while Heister recommends that we should incise the sclerotica. Finally, there are those who recommend a puncture first, and who afterwards enlarge the small wound by means of scissors or any other cutting instrument. But in truth, we have in reality only to choose between the process of Bidloo or rather of Galen, and that of Maitrejan and Heister. None of the others in fact attain the object better, and most of them are infinitely more complicated or much more dangerous. The species of cataract needle devised for this purpose by M. Adelman, who has shown it to me, and which has a groove upon one of its sides, would however possess the advantage of allowing of the escape of the liquid, while at the same time it reduces the operation to a simple puncture. The incision of the sclerotica, whether outwardly or below, and parallel to the fibres of this tunic, con-

stitutes in reality a puncture of little importance, and should have the preference if the aqueous humor could always escape through it. Unfortunately this is not the case. To derive any advantage from it in simple hydrophthalmia, it would evidently become necessary to divide through the sclerotica transversely at less than two lines from the ciliary circle, and under this point of view the section of the cornea is certainly a less serious operation. It is only then in cases of liquefaction of the vitreous body, and which are distinguished from ordinary hydropsy by the projection which the iris forms in front. that the operation by the method of Heister could possess some advantage. Moreover it is of little importance in such cases, whether we follow one process or another, inasmuch as the eye is usually lost beyond redemption.

II. *Operative process.*—After having arranged the patient and assistants, in the same manner as for extraction of a cataract; and after having properly separated the eyelids apart, and fixed the eye, the surgeon makes with the point of a lancet, a bistoury, Adelman's needle, or a keratome, held like a writing pen, an incision of from two to three lines in length, and at the lower or outer part of the cornea, as far as possible in fact from the pupil, and in such manner as not to wound the iris. It is unnecessary then to make any pressure on the globe of the eye. The aqueous humor immediately runs out; and an evident relief is generally the immediate consequence. So long as any hope remains of preserving the organ intact, it would be dangerous to do anything to prevent the wound from cicatrizing. We should dress in the same manner as after the operation for cataract, and should a new accumulation of the liquid seem to render it necessary, repeat this puncture at the expiration of a certain number of days, after the manner of M. Basedow, who gives four successful examples of it, and as I myself have frequently done. No one moreover, at the present day, would recommend that we should imitate Nuck and certain surgeons of the last century, by placing a piece of sheet lead between the eyelids, in order to be enabled to compress the eye from before backwards, so as to make it gradually re-enter into the orbit. A practice like this, which moreover is unworthy of discussion, could not have been adopted but by those who have confounded exophthalmia, buphthalmia, and proptosis, with legitimate hydrophthalmia. Should any point on the tunics of the eye be obviously more altered, prominent or attenuated than others, there is no doubt that this point should be preferred for the paracentesis, and that we should make it a place of necessity. When buphthalmia and the projection of the eye depend upon hydropsy or a dilatation of the sclerotica, it is then hydrophthalmia also that we have to contend with, and the puncture is indicated, as in the preceding cases. On the contrary, it could have no object, and must aggravate the condition of the patient, when the disease is owing to the development of some tumor, or to the existence of some organic lesion in the orbit.

C. *Hypopyon.*—Galen appears to have been the first who proposed paracentesis for hypopyon. Nevertheless he did not have recourse to it until after having unsuccessfully made trial of succussion (succussion), so much lauded by Justus, and which Heister and Mauchart

have since thought not unworthy of reviving. According to this author, we open into the lower part of the cornea, a little in front of its union with the sclerotica, and the pus soon escapes to the outside. Aetius recommends that we should perform it with the needle at some point upon the membranes which is not inflamed.

Guy de Chauliac, Benedetti, Paré, and Dionis have adopted the precepts of Galen with success, and despite the efforts of Nuck, Woolhouse and a great number of others, who like the Arabs recommended that we should confine ourselves to one puncture to enable us to suck out the effused matter, and who even went so far as to advise leaving the canula of the trochar in place, and afterwards making use of it for throwing injections into the interior of the eye; modern practitioners also restrict themselves to a pure and simple incision, when they decide upon treating hypopyon by paracentesis. It would be in fact the *best process* to follow under such circumstances were the slightest operation then necessary, and if M. Gierl is to be believed, (*Journ. de Simmons*, t. I., p. 278;) but the small quantity of pus which forms the hypopyon very readily disappears of itself when the ophthalmia ceases; the way to augment its secretion and produce opacity of the cornea, is to open into the anterior chamber with any instrument whatever. Chronic purulent deposits, the only ones perhaps which paracentesis would not aggravate, are constituted of a matter too adherent either to the iris or the cornea, to enable us to evacuate them by means of an incision of a few lines in extent; we must place our reliance in fact upon general treatment, resolvent collyria, and an effort to put a term to such an affection, so long as it does not exceed the limits that belong to a true hypopyon, and so long as we have any hope of preserving the visual function. For all these reasons, I am of opinion, with Boyer and Dupuytren, that puncture of the eye, either with a trochar or lancet, is but rarely applicable to abscesses in the anterior chamber, unless like Lehoc we should employ it with the view of renewing the aqueous humor, and at the same time for evacuating the purulent matter.

D. *Empyesis*.—In abscess of the posterior chamber, that is to say, in empyesis or empyema of the eye, it would appear at first view that all the world would concur in the necessity of having recourse to paracentesis. It would however be an error to suppose so. Though many persons have recommended it; and in fact almost all the oculists of the last century frequently made use of it, it can nevertheless be then but a feeble resource. By it we evacuate but in a very imperfect manner the morbid collection. As it soon shuts up, the accidents which belong to it are remedied but temporarily. As soon as the eye is implicated it is irrecoverably lost, and there is no use in incising it any more. We ought to excise a sufficiently large portion of it to evacuate it completely and bring about atrophy. The seton employed in China and Japan, and which had already been eulogized by Woolhouse as a substitute for puncture, and revived by Ford, (*Southern Med. and Surg. Journ.*, June, 1838; *Gaz. Méd.*, 1838, p. 617,) is a barbarous remedy, and unworthy of any criticism.

E. *Practice of the author*.—I have however found that in all these cases repeated punctures on some *region of the sclerotica which remained intact*, by means of the point of a lancet, possessed



a great deal of efficacy. So long as the eye is distended and painful, whether there be *hypopyon*, *empyesis*, *hydrophthalmia*, or *ophthalmitis*, I have found nothing better than this practice. I choose the point of the sclerotica which is most visible and projecting, and plunge in the lancet there perpendicularly and parallel to the fibres of this coat. The relief is prompt and the operation may be repeated the day after.

### § VI.—*Excision of the Eye.*

*Staphyloma* of the cornea, empyema, hypopyon, and hydrophthalmia, are almost the only diseases which sometimes require excision of the anterior part of the eye, or for which we may properly have recourse to this operation. Its object is to evacuate the organ, to bring about its atrophy, and to transform it into a simple stump, which may be adapted to the support of an artificial eye. It is therefore a dernier resource, which is not allowable except where all others have failed, and only in cases where it has satisfactorily been demonstrated that the sight cannot be preserved or re-established. In hypopyon, empyesis, and hydrophthalmia, for example, it is not to be resorted to until after incision or puncture, unless the insufficiency of these last methods should have been previously ascertained. M. Dugas, (*Ibid.*) in a case of hemophthalmia, did not decide upon it until after having lost every hope of preserving the eye. The most ancient authors had already made use of it in prolapsus (procidence) of the cornea. Galen mentions it as a common method. Aetius recommends that we should associate it with the ligature; and that before removing the staphyloma, we should pass two threads through its base crosswise. The ligature that Paul of Egina and others proposed to apply either circular, crucial, or transverse, the taxis and compression proposed by Manget, and the crucial incision of Woolhouse, are now no longer in use, and all surgeons at the present day adopt the advice of Paré or of Louis when they wish to obtain a radical cure of staphyloma of the cornea, that is to say, they perform pure and simple excision.

A. *Operative process.*—Whether it be for one disease or another, we must, as soon as we decide upon not removing the entire organ, confine ourselves to the excision of its apex. Cancerous affections alone would constitute an exception to this rule, did they ever allow of a simple excision. In penetrating beyond the iris, up to the middle of the posterior chamber, we should incur the risk of seeing the muscles retract the rest of the sclerotica and the optic nerve to the bottom of the orbit, and of having no stump to the eye after the cure. On the other hand, if we should confine ourselves to a small opening, the humors contained in the chambers would only partially flow out, and the wound might cicatrize too soon, and leave only in its place a depression which would be as great a deformity as the staphyloma itself. We should avoid these two extremes by removing almost the entire cornea and without going any farther. Then we are sure that the vitreous humor will finally escape or be dissolved, that a new accumulation of humor will not take place to such extent as to produce a painful distension in the posterior chamber, and that after cicatrization, the muscles will be enabled to impart to the remains of the or

gan the greater part of the movements which it executed in its natural state, and transmit them to the artificial eye. Nothing is easier than an operation of this kind. The crucial incision with excision of the four flaps, as Richter recommends, is altogether useless. The patient being properly arranged and secured, we divide the lower half of the cornea with Daviel's instrument, the point of a lancet, or any bistoury or keratotome, in the same way as for extraction of the crystalline. The flap is immediately seized with a good pair of forceps, and detached in the remainder of its circumference, by means of a very sharp pair of scissors or of a bistoury directed from below upwards. An erigne plunged into the middle of the segment to be removed would render its excision still more prompt and certain in intractable subjects or in those in whom it might be difficult to steady the eye. This process, more simple than that of Terras, who passes a thread through the tumor in order to exsect it more readily afterwards, would enable us in fact to remove as rapidly as possible, and with a single stroke of the instrument, the totality of the cornea or staphyloma, by directing upon its base a good bistoury, which should be made to act either from above downwards or below upwards. The guillotine of Guérin, extolled by Demours, would not be more convenient, and has no claim to a preference.

I. *Consequences*.—There is generally developed after this excision a sufficiently active inflammation in all the parts contained in the orbit, together with fever and cephalalgia, and sometimes even symptoms much more serious. In general, however, at the end of from eight to fifteen days, the swelling which it has occasioned begins to diminish; the suppuration, at first abundant, soon dries up, and towards the end of the month, or a little sooner or a little later, we are enabled to adjust the artificial eye. As it is not an operation without danger, we ought to make this known to those who demand it for simple deformities, and ought not to perform it under such circumstances, except at their solicitation, as in cases, for example, of ancient staphyloma, unaccompanied with pain. When, on the contrary, the disease which it is designed to remedy is dangerous in itself, as empyema, hydrophthemia, &c., we must not hesitate. Before such affections as these, every apprehension should be banished. Punctures of the sclerotica, I should think, would diminish the inflammatory reaction and ought to be had recourse to.

## § VII.—*Extirpation of the eye.*

Though extirpation of the eye was not clearly described until near the close of the sixteenth century, there is however every reason to believe the ancients had had recourse to it quite frequently. There were two principal classes of conditions in which it was made use of: 1st, for proptosis, or the fall of the eye; 2d, for deep-seated diseases and degenerations of this organ.

A. *Proptosis—Exorbitism—Fall of the eye*.—J. Lange, who wrote in 1555, boasts of having caused the re-entrance into the orbit of an eye which certain surgeons had proposed to extirpate. Donat, at a little later period, in 1588, endeavored to demonstrate the inutility of this operation, and maintained that compression, aided by the judi-

cious employment of internal remedies, always triumphed over those diseases which seem to require it; which proves at least that for a length of time it has been known to practitioners. Bartisch, therefore, who only published his work in the year 1583, has no claim to the merit of the invention, and has only drawn attention to a serious operation, and one which had already been performed, but the execution of which he rendered more easy.

Some authors, as Covillard, Lamswerde, and Spigel, also profess to have cured without an operation, patients in whom the eye violently protruded from the orbit and hung upon the cheek. A. Seigneur stated to Guillemeau, (*Œuvres Chir.*, p. 743, edit. 1612.) that his surgeon seizing an eye which had fallen to the ground, successfully replaced it in the orbit. An eye which had issued from the orbit in consequence of inflammation, was replaced by Loyseau, (*Obs. de Méd. et de Chir.*, p. 46; *Corps de Méd.*) The eye of Captain Naldi, according to Rhodius, (Bonet, t. III., p. 50,) which had been driven from the orbit by a blow given by a Turk, miraculously returned to its place by means of a large cupping glass upon the occiput. In a young infant, the eye which had inflamed and become as large as an egg, and escaped from the orbit, returned there by means of topical applications administered by F. Plater, (Bonet, t. III., part 2nde, p. 50.) Verduc (*Pathol. Chir.*, t. II., p. 44-47, in 12,) does not admit the fact of Covillard, but Lemaire, (*Eaux de Plomb.*, &c., p. 59,) saw the same thing in a hemiplegic at Plombières. Salmuth, (Cent. 2, hist. 42, citat d'Ettmuller, *Prat. Méd.*, t. II., p. 401. French trans.) speaks of an epileptic, in whom the eye during a paroxysm protruded to the size of the fist, and returned after this had ceased. Verduc, (*Pathol. de Chir.*, t. II., p. 244, in 12, 1719,) moreover, admits to have seen a young painter, whose eye descended to the middle of the cheek, and which in less than the space of an hour, descended from, and returned to the orbit more than six times. In a patient of C. White's, (*Cases in Surgery*, 1770; *Gaz. Salut.* 1771, No. 27, p. 3,) the eye, luxated upwards by the contraction of its levator muscles, was relieved by the taxis: a wound made by a fragment of pipe-stem which had entered at the bottom of the orbit, was the cause of the difficulty. In a case of protrusion of both eyes, says Rossi, (*Elem. de Méd. Oper.*, t. I., p. 203,) which took place after violent vomitings, I found after the remedies which I had employed to give greater strength to the muscles of the eye in restraining the globes, that the use of electricity and camphorated vapor produced a marvellous effect. M. Champion has known an old lady who was affected with strabismus in the left eye, and in whom this infirmity succeeded after the reduction of the eye, which had been driven from the orbit out upon the cheek in consequence of a blow received upon the temple. I frequently meet, says the same practitioner, with a retired officer, who declares that he had a protrusion of the right eye which it had been proposed at the time to excise, but which was perfectly reduced and is now in possession of all its functions. The accident was said to have been produced by a ball which had traversed the left orbit, and which had come out at the inner angle of the right one. Maitrejan has long since shown the impossibility of such a result taken literally; but Louis has very



justly remarked, that in divesting the assertions of observers of every thing hyperbolical that they possess, we find in them the proof that the optic nerve and the muscles which surround it may undergo a considerable degree of elongation without necessitating the extirpation of the eye. We have, moreover, numerous examples of this elongation effected in a gradual manner, in cases of exostoses, and tumors of every description in the orbit, nasal fossæ, maxillary sinus, &c. If the eye really hung down on the outside, in consequence of a traumatic lesion, we should then, instead of attempting to replace or preserve it, complete its separation and remove it immediately. In such cases there is no process to be given. A single cut of the scissors or bistoury sometimes suffices, and the conduct of the surgeon must necessarily be regulated according to the accidents which exact so severe a remedy. When on the contrary the eye has only been expelled gradually from the orbit, whether entirely or partially, or whether it be or be not in itself disorganized, we should do wrong to attempt its extirpation.

It is not to the eye itself that the resources of surgery are to be addressed. Let the operator destroy, or cause the disappearance of the principal disease if he can, and the displaced organs will soon resume their normal situation. St. Yves cured a severe exophthalmia, by effecting the resolution of scirrhusities which had been formed in the bottom of the orbit. Brossaut, who is mentioned by Louis, has seen the vision re-established, and the eye re-enter into its cavity, when the exostosis of the ethmoid which had caused its expulsion had been destroyed; Guérin of Bordeaux, and Dupuytren, have brought about the same result by removing the various tumors and cysts, of which the tissues which surround the eye are very frequently the seat. Extirpation of the eye therefore is not called for in buphthalmia nor exophthalmia, whatever may be their cause, nor in hydrophthalmia, empyesis, or staphyloma.

B. *Cancers of the Eye and the Orbit.*—Cancerous affections only allow of our undertaking extirpation of an eye which has not been displaced. Even when their existence has been well established, the question still remains whether the operation should be attempted. Those who go for the affirmative, with Desault, &c., argue principally that cancer of the eye is much more frequently observed in children than in adults, and that in the younger period of life its reproduction is much less to be apprehended than after puberty. Others appeal to the researches of M. Wardrop, which show that the disease is almost always constituted of *fungus hematodes*, a melange of encephaloid, erectile, colloid or melanotic tissue, or one of those substances only. But since there is no variety of cancer which repululates, either in the same place or elsewhere, with more obstinacy than this, they maintain that it would be inflicting unnecessary suffering upon the patient, and that we ought to limit ourselves to simple palliatives. What analogy and reasoning had foreshown to them, experience has but too often demonstrated. Whatever, in fact, some authors may have said on this subject, the labors of the ancients, like those of the moderns, sufficiently prove that the ablation of cancer of the eye is not less liable to a return of the disease than that of any other part. I would not, however, therefore conclude that we ought to

remain inactive. Far from that, I think we ought to exert ourselves to operate before the viscera have had time to become invaded by the morbid germs, and as soon as the nature of the disease appears no longer doubtful, and so often as it shall appear to be practicable to remove it entire. All this, however, belongs to the general question, whether it is advisable or not to operate for cancer.

1. *Operative process.*—*a. Process of Bartisch.*—The extirpation of the eye, much more frightful than difficult, more formidable by its consequences than its immediate dangers or the difficulty of its execution, may be performed by quite a number of different modes. We find no details on this point in authors before the time of Bartisch, who, in order to excise the diseased parts, found no other instrument necessary than a species of spoon with cutting edges, like that used by shoemakers. Though no person at the present day would venture to recommend so crude an instrument, it is incorrect to say that it exposes to the risk of fracturing the bones, and that it renders the operation much more difficult than with any other knife. Its dimensions, it is true, do not allow of our carrying it as far as the extreme depth of the orbit, but I do not find that it is often required to go to this distance. To be just, therefore, we should limit ourselves to its rejection as useless, or possessing but little advantage. The excavated scissors of Delpech, (*Dict. des Sc. Méd.*, t. VII., p. 528,) and the concave scalpel of Mothe, (*Journ. Gén. de Méd.*, t. XLVIII., pp. 121—136,) are scarcely better.

*b. F. de Hilden*, who had occasion to extirpate an eye in 1596, proposed at first to embrace the projecting part by means of a string purse. After having censured the instruments of Bartisch, (Cent. 6, obs. 1,—Bonet, *Corps de Méd.*, p. 389,) he speaks of the simple strangulation extolled by C. H. Chapuis. Detaching the tumor from the eyelids by the cuts of the bistoury, he employed for the section of the muscles and optic nerve a sort of scalpel with two cutting edges, curved flatwise, and truncated at its point. In this process we already recognize the principles of a more enlightened surgery, and the practitioner mentioned by Bartholin (Louis, *Dict. de Chir.*, t. II., p. 124,) is justly censurable for not having profited by it about fifty years subsequently, and for not having recoiled at the idea of tearing out the eye by means of a pair of hooks. The instrument of Hilden, though more ingenious, has nevertheless met with the same fate as that of Bartisch. If Job-a-Meckren succeeded with the spoon of the oculist of Dresden, and Muys and Leclerc with the knife of Hilden, Lavauguyon maintained that a good lancet fixed on its handle would always suffice, and might be substituted for them. St. Yves, for every step of the operation, found nothing else required than a thread to secure the cancerous mass, and a cutting instrument, which he does not designate. Nor do the observations of Bidloo make any mention of a particular knife, except it be a long bistoury bent to an angle, near its handle, and which is also praised by V. D. Maas.

*c.* It was Heister who showed, by sufficiently good reasoning, that an erigne or forceps, and the ordinary bistoury, which Hoin of Dijon had already found to answer in 1737, are sufficient for this operation.

*d.* Things were in this state when Louis undertook to systematize the ideas of surgeons on the extirpation of the eye. When the tumor

no longer holds on except by the root of the recti muscles and of the optic nerve, we must, says this surgeon, make use of a pair of scissors curved flatwise; pass them to the bottom of the orbit, then divide the musculo-nervous pedicle, and at the same time act with them as with a spoon to bring the whole forward.

*e. Desault*, who, in the first years of his practice, had adopted the process of Louis, ultimately abandoned the scissors as useless, and confined himself to the simple bistoury, which in fact is better than the curved bistoury of B. Bell. Sabatier, Boyer, Dupuytren, and all the operators of the present day, conform themselves to the recommendations of Louis or of Desault almost indifferently. With the curved scissors we run no risk of penetrating into the cranium or into the zygomatic fossa. Their concavity accomodates itself better to the form of the tumor, whose pedicle also they would seem to embrace with more security. But with a bistoury it is not necessary to change the instrument, from the commencement to the end. The section of the soft parts is more neat, and all that is required is to incline it in one direction while the eye is drawn in another, in order to reach with facility the root of this last. We should have to be very unfortunate or very inexpert to perforate with its point into the optic foramen or maxillary and sphenoidal fissures. It is therefore here also, as we have so often already said, an affair of choice or circumstances, much more than of necessity.

*First stage.*—The patient may, if necessary, be kept seated upon a chair, but it is better to operate upon him in bed, taking care to raise up his head considerably. The surgeon being placed upon the side of the affected eye, acts differently according as the surrounding parts are or are not invaded by the cancer. In the first case he adopts the precept of Guérin, and makes two semilunar incisions, which enable him to circumscribe the base of the orbit and to detach the eyelids from it in order to remove them with the rest of the disease. In the second case he is to do all in his power to preserve the connections of the eye. If they have contracted adhesions without having undergone an actual disorganization, he dissects each eyelid on its inner surface and reverses it outwardly. When the globe of the eye is found to be free behind, all that is necessary is to prolong with one cut of the bistoury the outer palpebral angle to the extent of about an inch towards the temple, as Acrel, and not Desault, appears to have been the first to have formally recommended. In all cases an assistant secures the head of the patient, and keeps himself prepared to follow and to favor all the movements of the operator. This last secures the projecting part of the tumor with his hand if he can, after the manner of Desault. Otherwise he makes use of a simple erigne or double hook, an erigne forceps like that of Museux, or the string purse of F. de Hilden, or better still, as St. Yves recommends, (or a strong simple ligature or ribbon cross-wise,) after the manner of Chabrol, (*Gaz. Salut.*, 1782, No. 49, p. 4.) passed by means of a needle through the degenerated mass.

*Second stage.*—The operator takes the bistoury in his right hand, holds it as a writing pen, and directs its point to the great angle of the eye; plunges it in while grazing the ethmoid bone as far as to the neighborhood of the optic foramen, makes it pass round flatwise the entire



lower semicircumference of the orbit; divides the attachment of the small oblique muscle, the oculo-palpebral groove of the conjunctiva, and some adipo-cellular filaments; then brings it back into the inner or nasal extremity of the wound; directs its cutting edge upwards and then outwards; divides the great oblique muscle, and endeavors to remove at the same time the lachrymal gland, when, by passing around the orbital vault, he arrives near the temple and finds himself at the point of uniting the two wounds by their outer extremity.

*Third stage.*—The eye now holds no longer than by means of a pedicle formed by the four recti muscles and the optic nerve. If, in order to divide this pedicle, we prefer the scissors, the operator glides them upon the inner rather than the outer side, with their concavity turned towards the tumor to as great depth as possible, and with a single cut completes the separation of the cancer. If any bridles still retain it, they are to be rapidly divided in the same manner, while with the other hand we make the proper tractions. If, in place of the scissors, the surgeon has recourse to the bistoury, he directs this also, by preference, upon the inner side. In this direction the orbital wall being almost straight, it is easy, by inclining the point of the instrument outward, to cross and divide the musculo-nervous pedicle. I am ready, however, to avow that with the bistoury, as well as with the scissors, it would not be attended with much more difficulty to attain the same object by following the temporal wall of the orbit. It was, in fact, here that Desault usually entered it by choice, remarking that this route was the shortest and most convenient.

An object more worthy of attention, is that we are more certain by this mode to avoid falling upon the maxillary and sphenoidal fissures. Whether the lachrymal gland be cancerous or not, we must when we have missed it, seize it immediately after with an erigne or forceps and extract it. The secretion of tears being no longer of any use must necessarily be injurious. It must be by inadvertence that some have thought proper to sustain the contrary opinion. This gland when left in the orbit after the removal of the eye, kept up a copious discharge of tears with accidents, which obliged M. Nelle (*Encyclogr. des Sciences Méd.*, 1838, p. 250) to extirpate it six months subsequently. We may moreover, by directing the forefinger into the orbit, accurately ascertain the condition of the parts that remain; and if there are any of them which are not sound, we should endeavor to reach them before we have finished the operation, and remove or destroy them, either by means of the bistoury, the scissors, or even the rasp.

II. *Dressing.*—No artery of any size can have been wounded. All those which are divided come from the ophthalmic; and their ligature is unnecessary, even though the blood should flow in abundance. Small balls of lint sprinkled or not with colophane and more or less pressed upon, would be sufficient to arrest it. In ordinary cases we fill up with lint the void which has been left, but moderately and as if for the purpose of supporting the posterior surface of the eyelids. The sponge, which has been proposed by some practitioners in lieu of this substance, would have the disadvantage of

irritating the tissues by becoming swollen in the middle of a solid cavity. The small bag filled with emollient cataplasms also, as recommended by M. Travers, and which is placed over all the other dressing in order to prevent the slightest degree of compression, does not appear to me to present any real advantages. At the expiration of four or five days the suppuration is established. The lint is removed without any effort. Nor is there any objection if we wish to make the removal of the first dressing still more simple, in covering the bottom of the wound with a fine linen besmeared with cerate and perforated with holes, and which serves as a sac to the compresses, and when the eyelids have been removed may be easily reversed upon the contour of the orbit. A soft plumasseau, and which is sufficiently large to support in front the more deep-seated portions of the dressing, together with a long compress placed obliquely, and the monocle bandage, complete the dressing, which the least skillful surgeon moreover will know how to modify in a proper manner, should circumstances make it necessary. After its first removal, which is from the third to the sixth day, the dressing has no longer any thing particular in it. The wound being washed with tepid water and gently wiped out, should be supplied each time with a small quantity of dry lint. The eyelids being gently raised up and protected by small bandelettes besmeared with cerate, are finally covered with a soft plumasseau and a compress; the whole is supported by the monocle and a few turns of bandage. The cure is usually effected between the third and tenth week.

III. *Remarks.*—Though the preservation of the eyelids would render the deformity less repulsive, it would nevertheless be preferable to sacrifice them rather than not to destroy the remotest vestiges of the disease. The incision at the external angle renders the remainder of the operation more easy, and does not involve any particular accident. One point of suture or a simple adhesive strap would moreover effect its reunion without any exertion or inconvenience. If we should commence by the superior incision, the blood which oozes out would necessarily create a slight degree of embarrassment for that below. The eyelids having their fixed point upon the inside, we manipulate with more security from the nose towards the temple than from the outer to the internal angle. When the globe of the eye alone is affected, as it is attached in front only by the fold of the conjunctiva and the oblique muscles, it is not necessary to carry the instrument over an inch in depth. On the contrary, when adhesions are established between the soft parts and the bones, we must go as deep as the bottom of the orbit. In such cases the spoon-knife of Bartisch, the scalpel of Hilden, and the bistoury of Bidloo, would incur the risk of fractures, which it is always advisable to avoid. It is under such circumstances also that any sharp-pointed instrument whatever, if directed without precaution, might fracture the frontal bone and penetrate into the brain, should we, in order to reach with more certainty the levator muscle or lachrymal gland, elevate its point too much; or it might arrive into the maxillary sinus and divide the suborbital nerve or vessels, if we should incline it too much in the opposite direction; or penetrate into the nasal fossæ inwardly, or into the zygomatic or pterygo-max-

illary fossa posteriorly, and wound the second branch of the fifth pair of nerves (nerf trijumeau) or the internal maxillary artery; or in fact penetrate into the cranium through the sphenoidal fissure, and wound the middle lobe of the cerebrum. If the bistoury, however, should not graze the bones, we should incur the risk of not removing all the cancer, and of being obliged to operate again afterwards. The lachrymal gland in particular being almost entirely concealed behind the external orbital process, cannot be extracted with the eye except with a good deal of difficulty.

The rasp recommended by Bichat, or the chemical caustics, would be less dangerous than the *actual cautery*, at least on the side of the orbital vault, should it become indispensable to go beyond the soft parts. In fact, the proximity of the brain would, under such circumstances, render the application of the iron extremely dangerous. Should the fungus have commenced at the exterior of the eye, there would be reason to apprehend that there were branches of it in the direction of the temple, sinus maxillary, the nose, &c. M. Simonin (*Decade Chir.*, p. 21, 1838,) having extirpated the eye, was obliged to resort to tamponing; and his patient died. The roof of the orbit was perforated, and blood was found under the dura mater. Being desirous of arresting the blood and of destroying some remains of cerebroid tissue in the temporal fossa and maxillary sinus, I applied there an olive-shaped cautery, avoiding with care the vault of the orbit. The patient died on the third day, and we found an extravasation of blood in the corresponding lobe of the brain. Was it the operation which was the cause of this apoplexy, or was it not only a mere coincidence? Though we may be in the habit of employing the same hand for the first and second incision, it nevertheless appears to be more convenient for the right eye, for example, to execute that of below with the right hand, and that of above with the left one, unless we wish to make one of them from the temple to the nose. We divide the levator muscle, because otherwise it would constantly tend to draw the upper eyelid inwards after the cure, and might in this manner still further increase the deformity. I have forgotten to say that Dupuytren began with the upper incision, and that he terminates by detaching the organ from the summit to the base of the orbit.

### § VIII.—*Artificial Eyes.*

Nothing, doubtless, would be more desirable than to be enabled to make use of an enamel eye, when the disease has permitted us to preserve the integrity of its movable coverings; but we must not flatter ourselves too much on this point. The orbit, like all other natural cavities, when once emptied and void shrinks upon itself. Its walls approximate gradually from the bottom to the exterior. Its circumference diminishes and becomes depressed in such manner that at the expiration of a certain time, it is found to be almost completely effaced by this contraction, and also by the development of a fibro-cartilaginous substance. The eyelids being obliged to conform themselves to this retraction, contract adhesions on their posterior surface, are deformed, and become in most cases incapable of adapt-

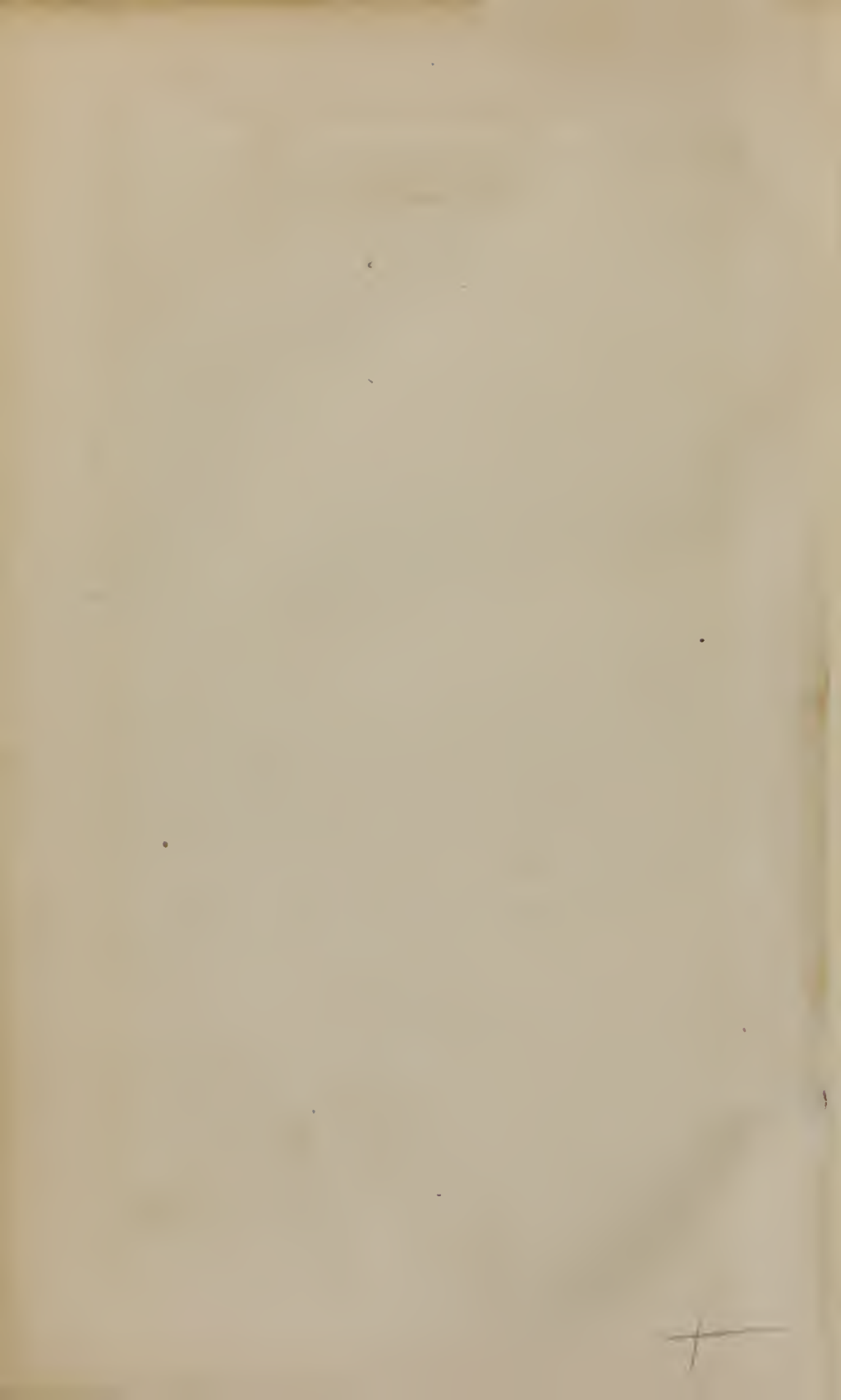


ing themselves to the artificial organ that we wish to place behind them. If the patient, therefore, is desirous of concealing his mutilation, we must be prepared whether the eyelids have been destroyed or not, to be under the necessity of employing only spectacles that have been artistically arranged, or with a colored plate, which is to be fixed in front of the obliterated cavity. The ancients, as it appears, devoted more attention to these matters than ourselves. We find that they had two species of artificial eyes, one to be inserted as at the present day behind the eyelids; the others, which were still used in the time of Paré, who is said to have been the first who spoke of them, and which were a sort of convex plates upon which the anterior part of the eye and its coverings were painted in wax colors, were to be kept in place by means of a spring. Formerly the first were made of gold or silver: at the present day the enamel is properly preferred. In these eyes everything is to be represented, the cornea, the iris, pupil, the sclerotica and its vessels. To apply them, one of them was held by the extremities of its longest diameter with the forefinger and the thumb, in order to pass its upper border under the frontal eyelid, while the eyelid was gently raised up with the other hand. This being done, it enters so to speak of itself, as soon as the other eyelid is depressed. In order to remove it when going to bed at night, the patient glides under it the head of a pin, and depresses the lower eyelid while drawing the lid forward. Being deposited in a glass of water during the night, this eye should be carefully cleansed every morning before being replaced. It is unnecessary to remark that its dimensions ought to be in relation with the orbit of different individuals, and that it is important that another eye should be substituted as soon as the first begins to change. When the enamel eye has been properly constructed, and that the two posterior thirds of the natural eye remain to form a stump, the resemblance sometimes is so striking as to produce a complete illusion. In the contrary case, as it is not susceptible of movement, it remains fixed in the centre of the orbit, and unfortunately cannot be concealed in those who are obliged to wear it.

[M. Morant, of Mettray (*Arch. Gén. de Méd.*, June, 1844, 4e sér., t. V.) having found cases of epidemic ophthalmia accompanied in the beginning with coryza, was thereby induced to try repeated *cauterizations* to the *mucous membrane of the nasal fossæ*, which proved in many instances an effectual remedy.]

*Encysted spheroidal liquid tumors in the anterior chamber of the eye*, with the capsule and contained liquid more or less transparent, and the whole adherent to the iris, have been noticed in a few instances, (see a case by J. Dalrymple, *London Lancet*, August, 1844, and Tywell on *Diseases of the Eye*—also *Archiv. Gén.*, Paris, Mars, 1845,) and are cured either by puncture or by dissecting out the cyst.

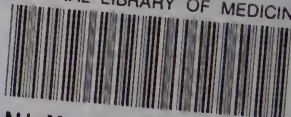
*Abrasion of the cornea for cure of Opacity*.—M. Malgaigne exhibited to the Royal Academy of Sciences of Paris, April 28, 1845, (see *Arch. Gén.*, June, 1845, p. 236.) a young girl in whom an opacity of the cornea was completely removed, and transparency restored, by an abrasion of one half the thickness of this coat two years before. T.]







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